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AIR POLLUTION ABSTRACTS

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This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 30586 - 31610.

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VOLUME 4, NO. 11 NOVEMBER 1973

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Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given.

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As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching ---more than those included in the subject index in each issue.

Feedback from our users, including suggestions of articles, are always welcome

APTIC Publications

Air Pollution Aspects of Emission Sources: Primary Lead Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:126, $0.65.

Air pollution Aspects of Emission Sources: Primary Copper Production - A Bibliography with Abstracts, June 1973 GPO No. EP 4.9:125, $0.70.

Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography with Abstracts, March 1973, GPO No. EP 4.9:121, $2.35.

Air Pollution Aspects of Emission Sources: Primary Aluminum Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:119, $0.90.

Mercury and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:114, $1.25.

Odors and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:113, $3.00.

Air Pollution Aspects of Emission Sources: Petroleum Refineries - A Bibliography With Abstracts, July 1972, GPO No. EP 4.9:110, $1.25.

Air Pollution Aspects of Emission Sources: Iron and Steel Mills - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:107, $1.00.

Air Pollution Aspects of Emission Sources: Boilers - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:105, $2.00.

Hydrochloric Acid and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:100, $0.55.

Chlorine and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:99, $0.55.

Air Pollution Aspects of Emission Sources: Electric Power Production - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:96, $2.25.

Air Pollution Aspects of Emission Sources: Cement Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:95, $0.50.

Air Pollution Aspects of Emission Sources: Sulfuric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:94, $0.65.

Air Pollution Aspects of Emission Sources: Nitric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:93, $0.45.

Air Pollution Aspects of Emission Sources: Municipal Incineration - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:92, $1.00.

Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes), March 1971, GPO No. EP 4.9:88, $6.25.

Beryllium and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:83, $0.40.

Asbestos and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:82, $0.50.

Municipal Incineration: A Review of Literature, June 1971, GPO No. EP 4.9:79, $1.00.

Hydrocarbons and Air Pollution: An Annotated Bibliography (2 Volumes), October 1970, GPO No. HE 20.1309:75, $5.00.

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RECENT CONTRACT AWARDS

from the

Durham Contract Operations
Contracts Management Division, EPA

Contract No. 68-02-1267, RFP No. Du-74-B326 .... *$149,530*
INTERACTIONS OF VARIOUS AIR POLLUTANTS ON CAUSATION OF PULMONARY DISEASE.
IIT Research Institute, 10 West 35 Street, Chicago, Illinois 60616

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS–PLANTS AND LIVESTOCK

Effects on vegetation–crops, trees, other plants–and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS–MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

1973

30586 **APTIC NO. 52667**

Mitsubishi Research Inst. (Japan)

A STUDY ON THE DISTRIBUTED AMOUNT OF AIR POLLUTANTS IN OUR ENVIRONMENT (IV) -- AN INVESTIGATION IN DISTRIBUTED SOURCES OF NITROGEN OXIDES. *(Kankyo ni okeru taikiosen busshitsu no bunpuryo ni kansuru kenkyu (IV) -- chissosankabutsu no bunpugen taiyo ni kansuru kenkyu chosa). Text in Japanese. 112p., March 1973. 144 refs.*

Sources of nitrogen oxides and control methods are discussed. Control techniques include combustion modification, exhaust gas recirculation, catalytic reduction, and the use of alternate power sources and engines for automobiles. Stationary sources, industrial sources, and automobiles are discussed. Emission factors, combustion processes, nitric oxide, nitrogen dioxide, and chemical reactions are mentioned.

30587 **APTIC NO. 53160**

Calspan Corp., Buffalo, N. Y.

AUTOMOBILE EXHAUST EMISSION SURVEILLANCE - A SUMMARY. *Office of Air and Water Programs Contract 68-01-0435, APTD-1544, 86p., May 1973. 1 ref.*

NTIS: PB 220755

Information on emissions from light-duty vehicles is presented based on the findings and results of three exhaust emission surveillance programs conducted by the Environmental Protection Agency. Hydrocarbon and carbon monoxide emissions for the vehicles tested were assessed by comparing their mean emission levels with applicable Federal standards. Nitrogen oxide emissions, which were not subject to control during the model years covered by the programs, showed an increase of approximately 35% from measurements on pre-1968 vehicles to those on post-1968 vehicles. Hydrocarbon and carbon monoxide emissions generally showed a significant downward trend with newer model vehicles. Vehicles were sampled in several cities in an effort to assess the extent to which local climate, terrain, driving practices, and other geographically differentiated factors affect emissions. Only small differences were observed in the emissions measured in the cities surveyed, the only notable exception being Denver where significantly higher carbon monoxide and hydrocarbon emissions and lower NOx emissions were observed, presumably because of the effect of altitude on air-fuel ratios. The effect of mileage accumulation on emission levels was highly variable from one vehicle to another with initially low mileage vehicles (less than 60 miles) exhibiting a greater change in emission levels per 1000 mile increment than those having initial mileages in the 20,000 to 30,000 mile range. The test programs were conducted on as-received vehicles, and the test results may reflect to some extent the influence of such variables as state of maintenance and repair. (Author summary modified)

30588 **APTIC NO. 53275**

PUBLIC NUISANCE AND SAFETY. *(Kogai, anzen). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan, Tokyo), 52(554):567-571, June 1973. 17 refs.*

Sulfur oxides have decreased since 1968 in Japan and nitrogen oxides have increased. The new NOx air quality criterion of 0.02 ppm for daily average 1-hour value should be met within 5 years. An additional 3-year period may be permitted for unusually polluted districts. The oxidant criterion is 0.06 ppm for 1-hour value. The flue gas desulfurization capacity in Japan is 5.86 cu m/hr; this can take care of only 3.6 million tons of heavy oil consumption/yr, or about 3% of the oil consumption. Flue gas desulfurization plants are expected to increase to 174 in number and 20 million cu m/hr in capacity in 1975. A fluidized bed desulfurization process designed to handle 550 bbl/day of oil has been developed to reduce heavy oil sulfur content to 0.7%. The electric power industry is using two-stage combustion and exhaust gas recirculation to reduce NOx emission by 30%.

30589 **APTIC NO. 53302**

Tokyo Metropolitan Government (Japan), Bureau of Environmental Protection

RESULTS OF A SURVEY FOR THE CALCULATION OF AIR POLLUTANT EMISSION FACTORS. (STATIONARY SOURCES). *(Taiki osen busshitsu haishutsukeisu sanshutsu chosa kekka ni tsuite. (Kotei hasseigen)). Text in Japanese. Kankocho Kogaisenmon Shiryo (Public Nuisance Gaz.), 8(4):47-56, July 1973.*

Emission factors for various stationary sources were determined by surveying existing facilities in Japan. Sulfur oxides, nitrogen oxides, carbon monoxide, hydrocarbons (as methane), and aldehydes were measured at boilers and furnaces. Oil tanks, gasoline stations, tank lorries, printing shops, and painting shops were investigated to determine hydrocarbon evaporation. The emission factors for a power generation boiler fueled by crude oil are 3.55 kg/kl NOx, 0.13 (with electrostatic precipitator) or 0.560 (without) dust, negligible CO, 0.00725 HC, and 0.00360 aldehyde. The emission factor for SOx is given as the sulfur content of the fuel, which is 17.6% in the boiler. The HC emission factor for printing was 200 kg/ton of ink. In general the emission factors for SOx and CO were about the same as those previously announced by the U. S. Environmental Protection Agency, but the NOx, dust, HC, and aldehyde factors were far lower than the EPA counterparts. The lower NOx factor can be attributed to the use of higher quality fuel, boilers with less combustion load, and different operating conditions in Japan. The use of high performance dust collectors resulted in a lower dust emission factor for Japan. Lower CO can be attributed to a more adequate combustion temperature control system used in Japan.

30590 **APTIC NO. 52911**

Bapseres, Pierre

ASPECTS OF INDUSTRIAL CONTAMINATION IN TERMS OF REFINERIES. *(Aspectos de la contaminacion industrial en relacion con las refinerias). Text in Spanish. Ion (Madrid), 33(379):67-78, 66, Feb. 1973. 3 refs.*

Air pollution caused by different oil refinery components and the measures taken to control pollution are discussed. Harmful impurities include carbon dioxide, nitrogen, nitrogen dioxide, carbon monoxide, sulfur dioxide, soot, unburned particles, sulfur trioxide, gases emitted from large burners, dust from catalyzers, hydrocarbons, sulfur compound odors, and noise pollution from machinery. In order to control amounts of SO2, the refinery contains 10 sensors connected to the Office of Hygiene in Lyons. These sensors, however, give no indications of SO2 concentration points, only a daily average based on the entire city set of 20 devices. Dispersion of SO2 depends on three factors: gas concentration in fumes; chimney height (geometric height plus supplementary change of elevation); velocity and direction of wind as a height function; atmospheric thermal gradient as a height function; and the calorific value of gases emitted. Effective means of emission control are still under study. Gases and HC odors from large burners were under the legal limit. The identity of each odor is determined by chromatography, ionization, photometrics, or chromatography-spectrometry. Average hydrocarbon odors approach 10 ppm and sulfur odors approach .01 ppm. Studies on dust are still incomplete. Noise levels are, however, above the legal limit, and controls are still under consideration. Residual waters undergo various treatments to remove chemical contaminants such as HC, ammonia, sulfur, sulfuric acid, and phenols. Such water purification methods include passing, stripping, separation by weight, flocculation, flotation, and biological treatment.

30591 **APTIC NO. 52700**

Becker, B.

GAS TURBINES FOR PEAK POWER GENERATION. *(Gasturbinen als Spitzenstromerzeuger). Text in German. Tech. Mitt., 66(7):321- 327, 1973. 14 refs.*

Various gas turbines (industrial gas turbines and single shaft gas turbines) for peak power production are described. The waste gas which leaves the turbine has a temperature which is higher by 400 K than the ambient air. The utilization of this waste heat becomes economical with more than 1000 operating hr/yr. As example for a gas turbine with waste heat utilization, the combined heating and power plant Munich-Sendling is described, and a wiring diagram is presented. The plant has a hot water producer and an air preheater. The design of the combined heating and power plant Munich-Freimann is much simpler. It is equipped with two 81-MW-gas turbines. Since the difference between waste gas temperature and compression end temperature is smaller due to the higher pressure ratio, no air preheater is installed. Compact design, independence of cooling water and low pollutant concentration in the waste gas permits the erection near residential areas closest to the consumers.

30592 **APTIC NO. 52913**

Borneff, J., G. Farkasdi, H. Glathe, and H. Kunte

DOES THE USE OF TRASH COMPOST POSE A DANGER TO HUMAN HEALTH? (Fuehrt die Verwendung von Siedlungsabfallkomposten zu einer Gefaehrdung der menschlichen Gesundheit)? Text in German. Muell Abfall, 5(4):101-107, 1973. 14 refs.

Polycyclic hydrocarbons are ubiquitous pollutants. They may be present in urban trash if combustion residues or sewage sludge are added. They develop at the heating of organic substances to above 500 C. With the emissions by combustion engines, heaters, and other combustion processes, they get into the atmosphere. The wind carries them across the country. Through sedimentation and precipitation they fall out again. According to data found in the literature, 70 to 140 micrograms/yr of aromatics fall on 1 sq m of soil. In different soil samples, between 7 and 12 micrograms of aromatics were measured per 100 g dry substance. In black soil from Dachau, 3.9 micrograms benzo-3,4-pyrene and 20 micrograms benzo-3,4-fluoranthene per 100 g dry substance were measured. For determination of the relationship between the concentration of carcinogenic polycyclic aromatics in trash compost, the soil, and the fertilized plants, field and pot tests were carried out. The field tests began in 1967. The two pot test were carried out in the years 1969 and 1971. Fresh trash compost and silo compost made from trash, manure, and mineral fertilizer were used in the tests. Over the test period the aromatics concentration in the soil changed markedly. In most cases an increase was observed which could not be entirely explained by atmospheric fallout, since the concentration changes were not uniform. It is assumed that the activity by microorganisms had some influence.

30593 **APTIC NO. [illegible]**

Bramson, P. E. and J. P. Corley

AIR QUALITY. *In: Environmental Surveillance at Hanford for CY-1972. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., p. 24, 25, 28, April 1973.*

NTIS: BNWL-1727

Small amounts of nitrogen oxides are intermittently released from Hanford process facilities into the atmosphere, and coal-fired steam plants on the project release particulates and sulfur oxides within the constraints of the Federal Air Quality Standards. The Hanford Environmental Health Foundation, as a contractor with the Atomic Energy Commission, routinely measures the concentrations of nitrogen dioxide, sulfur dioxide, and suspended particulates in the atmosphere at several off-site locations in the vicinity of Hanford. Nitrogen dioxide and sulfur dioxide samples were collected using 24-hour sequential samplers operated at ground level monitoring stations. The highest average nitrogen oxide concentration was 0.007 ppm, 14% of the figure set forth in the Federal standards. All sulfur dioxide sample results were less than the detection level of 0.005 ppm, 20% of the figure set forth in the Washington state standards. Suspended particulates varied over a wide range due to heavy dust storms typical of the area. Fluctuations in nitrogen oxide and particulates were attributed to nonplant sources.

30594 **APTIC NO. 53399**

Burgess, T. L., D. N. Carter, and D. E. McEachern

DESIGN AND OPERATION OF MALODOROUS GAS INCINERATION SYSTEMS IN THE KRAFT PULP MILL INDUSTRY. *Paper Trade J., 157(9):27-28, Feb. 26, 1973.*

The conversion of reduced sulfur gases to sulfur dioxide by direct flame or thermal oxidation can be used to eliminate malodorous emissions from the kraft pulp mill industry. If gas streams are to be incorporated into the incineration system, either the gases should be diluted below 2% concentration or as much air as possible should be excluded and concentrated gases used. It is also desirable to eliminate steam and water vapor and to incorporate chemical and by-product recovery into the collection system. The most commonly used incineration unit is the lime kiln, which offers low capital costs and the recovery of sulfur dioxide and the heating value of the gases. In some cases, however, the kiln is not feasible. Alternative methods of incineration include the use of recovery boilers or separate incinerators. Both the disadvantageous in that, unless equipped with wet scrubbers, they will release sulfur dioxide into the atmosphere. Separate incinerators, however, offer the advantage of greatly reduced operating costs if the concentrated gas streams are used as a primary fuel source.

30595 **APTIC NO. 52865**

Butz, Heinz H.

SYSTEMS OF SUCCESSFUL INCINERATORS. *(Systeme bewaehrter Muellverbrennungsanlagen). Text in German. Umweltschutz- Staedtereinig. (Vienna), 10(6/7):131-133, 157-159, 1973. 9 refs.*

A survey of existing incinerators is given. It includes a discussion of the grate systems covering travelling grates, roller grates, and various kinds of stoking grates. The development of the last years led to an abandonment of small incinerators because they caused too much air pollution through their special form of construction and through inefficient operation and maintenance. In a country like Austria, the trend is toward medium-sized incinerators. For hygienic and clean disposal of all waste, the flue gases from incinerators must be thoroughly cleaned in dry or wet collectors. Experience has shown that waste can be incinerated without odor and dust emission. Since incineration takes place at temperatures above 750 C, and since electrostatic precipitators are designed only for temperatures of 350 C, the flue gases must be cooled. The following methods are customary: cooling by heat exchangers and injection of cold air or cold water. Heat exchangers are used for medium and large incinerators. Injection of cold air is customary for the small and smallest incinerators and yields a very clean operation.

30596 **APTIC NO. 53014**

Cairns, E. J., P. A. Nelson, E. C. Gay, R. K. Steunenberg, W. J. Walsh, J. E. Battles, H. Shimotake, J. P. Ackerman, M. L. Kyle, and D. S. Webster

DEVELOPMENT OF HIGH-SPECIFIC-ENERGY BATTERIES FOR ELECTRIC VEHICLES. PROGRESS REPORT FOR THE PERIOD AUGUST 1972-JANUARY 1973. *Argonne National Lab., Ill., 97p., April 1973. 20 refs.*

NTIS: ANL-7998

A high-specific-energy battery having the performance characteristics required for pollution-free electric automobiles was developed with lithium/sulfur cells using a molten lithium halide-containing electrolyte and operating at temperatures of 375-400 C. The performance goals of a single cell are a capacity density (at the 1-hour rate) of 0.4 A-hr/sq cm, a power density of 1-3 W/sq cm, a cycle life of 300-1000 cycles, and a minimum lifetime of 3 years. The present laboratory cells have electrode areas up to 60 sq cm (the goal is around 350 sq cm). The capacity-density and power-density goals are being achieved, but the lifetime and cycle life need further improvement. (Author abstract modified)

30597 **APTIC NO. 53439**

Dimitriades, Basil

EFFECT OF FUEL COMPOSITION ON REACTIVITY OF AUTOMOTIVE EMISSIONS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Chemical and Physics Lab., [illegible]p., 1973. 13 refs.*

The relationship between gasoline composition and the photochemical reactivity of exhaust emission was studied using 11 automobiles and 25 fuels. Fuel composition was determined by gas chromatography capable of resolving more than 200 fuel components. The reactivity of the exhaust emission was estimated from detailed composition data and determined directly using a smog chamber. The results indicated that exhaust reactivity increased with increasing levels of polyalkylbenzenes in the fuel. No other systematic patterns of high significance were detected concerning the correlation between exhaust reactivity and several broadly defined groups of fuel components. Evidence suggested, however, that this inability to relate exhaust reactivity to fuel composition resulted from inappropriate definition of fuel composition. Fuel composition should have been defined in terms of component groups such that the potential for exhaust reactivity would be the same for all components within each group. However, the classification of fuel components into such groups cannot be made unless more information is obtained regarding the combustion of hydrocarbons in the multicylinder internal combustion engine. (Author abstract modified)

30598 **APTIC NO. 52912**

Etterich, O.

ENVIRONMENTAL PROBLEMS OF MODERN HIGH-CAPACITY ARC FURNACES. *(Umweltprobleme moderner Hochleistungs-Lichtbogenoefen). Text in German. Rade Rundschau (Austria), no. 3:556-557, 1973. (Presented at the Electric Steel Industry Conference, Zurich, Switzerland, Oct. 25-28, 1973.)*

The decrease of environmental pollution by the steel industry despite the production increase by 16% between 1960 and 1971 is mainly due to the replacement of the Thomas process by electric melting and by the oxygen lancing process. With both processes, dust collectors reduce the dust emission to less than 150 mg/cu m waste gas. With the electric arc furnace a problem remains, that of the emission of carbon monoxide and fluorides. The CO can be removed by afterburning and the calcium fluoride can be replaced by other fluxing agents such as clay.

30599 **APTIC NO. 53274**

Furuhashi, Masakichi

OPERATION ROOM OF HOSPITAL, AND BIO-CLEAN - PARTICULARLY IN RELATION TO POST-OPERATION INFECTION PROBLEMS. *(Byoin no shujutsushitsu to baiokurin - Tokuni jutsugo kansen mondai tono kanren) Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 11(2):2-10, June 1973. 11 refs.*

The 1960 Public Health Laboratory Service Report covering 3276 cases surveyed at 22 hospitals showed that the rate of post-operation infection was 14% on the average. Pathogenic staphilococcus was responsible for more cases of the infection. In the following years, however, cases of post-operation infection caused by Gram-negative bacilli increased. A study made on 1500 cases of patients in 1964 indicated that the bacteria acquired when stitching the surgical cut did not have much to do with the post-operation infection of the cut (an endogenic infection). On the other hand, many significantly infectious bacteria were detected from the fingers, noses, and throats of the doctors and nurses involved in the respective operations, as well as from the antiseptic or sterilizing solutions. This indicates a significant possibility of exogenic infection calling for more serious attention. Bacteriological inspections of the operating rooms were performed to find that the nurses carried several types of pathogenic germs on their fingers and in their mouths and throats. The masks used at an operation were examined before, during, and after the operation. The quantity of airborne dust, and the relation between the number of dust particles and number of bacteria were also measured and analyzed. Self-infection (endogenic), cross infection (exogenic), and the bio-clean operating rooms designed to prevent infection caused by airborne bacteria are also discussed.

30600 **APTIC NO. 52881**

Gouldin, F. C.

CONTROLLING EMISSIONS FROM GAS TURBINES -- THE IMPORTANCE OF CHEMICAL KINETICS AND TURBULENT MIXING. *Combust. Sci. Technol., [illegible]):33-45, 1973. 30 refs.*

An ideal combustor composed of a fuel-air mixing zone followed by a perfectly stirred reactor and a series of plug-flow reactors is studied to determine emission levels of nitrogen oxides, carbon monoxide, unburned hydrocarbons, and soot from gas turbines. These emissions can be reduced to negligible levels provided the stirred reactor is operated at high mass loading rates and mixing is perfectly controlled. Practical combustors were highly unmixed systems which resulted in low combustion stability, long stay times, and larger than necessary nitric oxide formation. Mixing is discussed in terms of the turbulence required to do the mixing. Mixing was related to large scale eddy break-up with a characteristic time. Significant gains in emission control can be obtained by increasing turbulent intensity.

30601 **APTIC NO. 53042**

Hark, W. B.

ENVIRONMENTAL CONTROL IN RAIL TUNNELS. *Tunnels Tunnelling, 5(3):252-253, 255-257, May 1973. 10 refs.*

Although aerodynamic pressure environment and vehicle drag are important aspects of vehicle tunnels, tunnel ventilation cannot be ignored. The thermal environment, pressure, airflow, and air quality are defined. Although the paper deals specifically with rail tunnels, definitions can also be applied to road tunnels. All aspects of the environment in a tunnel are influenced by the choice of tunnel size and shape for a given loading gauge. Emissions from traction units and auxiliary equipment, fumes or dust from routine maintenance, and combustion products from fires are the major sources of air pollution. Main line rail tunnels, the Rapid Transit System Underground, and subways are discussed. Approached from the standpoint of an airflow management policy, draft relief has wider implications for the environment.

30602 **APTIC NO. 53046**

Herzog, Henry W., Jr.

AN ENVIRONMENTAL ASSESSMENT OF FUTURE PRODUCTION-RELATED TECHNOLOGICAL CHANGE: 1970-2000 (AN INPUT-OUTPUT APPROACH). *Technol. Forecasting Social Change, 5(1):75-90, 1973. 9 refs.*

A technique, or model, was developed to systematically assess the environmental impact of specific technological changes forecast to occur over this and the next two decades. The core of the model is a dynamic technical coefficient matrix of a large input-output model. The technological change considered is that which affects the coefficients of the matrix and thus the distribution of material inputs over time into the various sectors of the United States economy. An environmental assessment of this production related technological change is achieved through a submodel that registers production residuals on an industry basis for 14 waste categories. Tables showing the effects of future input substitution on the total pollution loadings, and of technological change on the pollution loadings are presented. (Author abstract)

30603 **APTIC NO. 53059**

Hill, Jacques A. F. and Philip O. Jarvinen

PUMPING CAPACITY OF VENTURI EXHAUSTS. *J. Aircraft, 19(7):444-446, July 1973. 1 ref.*

The performance of a ram air operated airborne combustion unit or aircraft heater is determined largely by the amount of air which may be forced through the combustor/duct system by the differential air pressure. Venturi exhausts may be used to provide additional pressure drop across the system or to pump gases with densities that differ from the pumping gas. The variation of venturi suction pressure with pumped gas flow rate, the optimum location of the pumping orifice in the venturi, and the effect of varying the density of the pumped fluid by using both air and helium gas were studied experimentally. The pumping characteristics of the venturi are invariant with respect to the density of the pumped fluid if the pumping rate is expressed in volumetric terms; the optimum location of a circumferential orifice is of the order of one diameter downstream of the throat and varies with the design flow rate; and a suction pressure corresponding to -1 (the pressure drop seen by the system essentially doubled) is achieved if the pumped volume is limited to 15% of the reference flow through the venturi throat.

30604 **APTIC NO. 52903**

Hiraga, Katsuo, Takao Hamada, and Masakatsu Suzuki

PASSENGER CARS. *(Joyosha). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 27(6):555-568, June 1973.*

The 1972 model automobiles are discussed including design trends, pollution control, safety requirements, emission standards, and car production. Regulations in Japan and the U. S. give standards for nitrogen oxide, hydrocarbon, and carbon monoxide emissions. Import and export figures for automobiles are mentioned.

30605 **APTIC NO. 52678**

Hirasawa, Shinzo, Misao Kawai, Kunio Miyajima, Masaaki Oya, and Tsuyoshi Yamada

A STUDY ON THE TECHNIQUES OF PREVENTING NOX EMISSIONS FROM FIXED COMBUSTION EQUIPMENT -- (NO. 2) EFFECT OF AIR RATIO AND COMBUSTION METHOD ON THE FORMATION OF NO. *(Kotei nenshosochi karano sankachisso boshi gijutsu ni kansuru kenkyu -- (Dai 2ho) kukihi oyobi nenshohoho nado no issankachisso no seisei e no eikyo). Text in Japanese. Preprint, Japan Society of Chemical Engineering, Tokyo, p. 166-167, 1973. (Presented at the Japan Society of Chemical Engineering, Study Meeting, Niigata, Japan, July 19-21, 1973.)*

During an experimental study with kerosene as a fuel, the relationship between the air ratio and the nitric oxide emission concentration, the effect of the preheating temperature of the combustion air, and the method of controlling nitrogen oxides formation by improvement of the combustion method were studied. The experimental combustion chamber is described. The air ratio which produces maximum NO was 1.03-1.05; the NO concentration was 330 ppm. Above and below this air ratio, the NO decreased.

30606 **APTIC NO. 52679**

Hirasawa, Shinzo, Misao Kawai, Kunio Miyajima, Masaaki Oya, Tsuyoshi Yamada, and Nobuo Kido

A STUDY ON THE TECHNIQUES OF PREVENTING NOX EMISSIONS FROM FIXED COMBUSTION EQUIPMENT -- (NO. 3) RELATIONSHIP BETWEEN THE KIND OF FUEL AND THE AMOUNT OF NO. *(Kotei nenshosochi karano sankachisso boshi gijutsu ni kansuru kenkyu -- (Dai 3po) nenryo no shurui to sankachisso seiseiryo to no kankei). Text in Japanese. Preprint, Japan Society of Chemical Engineering, Tokyo, p. 168-169, 1973. (Presented at the Japan Society of Chemical Engineering, Study Meeting, Niigata, Japan, July 19-21, 1973.)*

The relationship between fuel composition and nitric oxide produced, the effect of the addition of water vapor on the amount of NO, and the effect of a burner with a water cooling section were studied experimentally. Heavy fuel oil A, heavy oil D, light oil, methanol, methane, and city gas were tested. Liquid fuels other than methanol had the same tendency as kerosene in the relationship between the air ratio and NO concentration. The NO concentration was higher for heavy oil and was the same for kerosene and light oil. The air ratio at the peak time was more than 1.0 for heavy oil, and NO was 450 ppm; it was 0.95-1.15 for methanol, and NO was 35-60 ppm. The NO concentration was 140 ppm for city gas and 165 ppm for methane gas.

30607 **APTIC NO. 53520**

Hirst, Eric and Timothy J. Healy

ELECTRIC ENERGY REQUIREMENTS FOR ENVIRONMENTAL PROTECTION. *Pub. Util. Fortn., 91(10):52-58, May 10, 1973. 36 refs.*

The electric energy required for operation of the following environmental protection strategies is discussed: electric mass transit, waste water treatment, solid waste disposal, air pollution abatement, waste heat dissipation, and electricity conservation. If 10% of urban auto traffic had been replaced by urban mass transit in 1970, the latter would have required 21 billion kilowatt-hours during that year (1.5% of the total kwh consumption of that year). Primary or secondary treatment of all waste water in the United States during 1970 would have required 25 billion kwh, or 1.8% of the total consumption for that year. The incineration of all the solid waste generated by the U. S. in 1970 would have required 5 billion kwh, or 0.4% of that year s total consumption. The control of air pollution at stationary sources in 1970 would have required 39 billion kwh, or 2.8% of that year s total consumption. Additional air pollution control would be achieved by the use of mass transit. The use of cooling towers at power plants to achieve waste heat dissipation would have required 14 kwh in 1970, or 1.0% of that year s total consumption. The following strategies could be used to conserve electricity: generation of electricity from solid waste incineration (conservation of 25 billion kwh in 1970); increased recycling (conservation of 23 billion kwh if recycling had accounted for one-third of the production of steel, aluminum, and paper in 1970); shift in home heating to gas or heat pumps, coupled with increased insulation (conservation of 44 billion kwh in 1970); and use of energy efficient air conditioners, coupled with increased insulation (conservation of 16 billion kwh in 1970). The implementation of all of these strategies in 1970 would have resulted in a net conservation of 4 billion kwh, or 0.3% of the total energy consumption for that year.

30608 **APTIC NO. 53165**

Hohl, R.

DISTRICT HEATING FOR SWITZERLAND: THE TOTAL ENERGY CONCEPT AND ITS POSSIBLE ROLE IN A LOW-POLLUTION OVERALL ENERGY SUPPLY. *Brown Boveri Rev., 60(6):253-264, June 1973. 7 refs.*

Roughly 45% of Switzerland s total energy consumption is accounted for by air-polluting individual oil fired systems for space heating and hot water services. With reference to the proven technique of the combined heat and power plant, a model is proposed which in addition to its established advantages, has two decisive features. The first is that the heat for the district heating networks can be generated from any energy source, in the future especially from that source which is the most suitable in terms of atmospheric pollution and a general supply policy. The second is that by coupling heat and power, it is possible to provide the urban centers with hot water and heat and the great majority of Switzerland s remaining population centers directly with electricity generated at the same time. This would eliminate over 95% of the separately fired systems. Domestic hot water will be heated on a base-load arrangement by nuclear power stations, partly by supplies of heat, and partly by electricity. With regard to the second largest source of pollutant emission, the internal combustion engine, the substitution of an electric motor and battery system would not present the electricity generating industry with any inordinate difficulties. It would, in fact, utilize the installed plant better and so lower the price of producing energy.

30609 **APTIC NO. 53024**

Hooker, M. L., G. A. Peterson, and D. H. Sander

AMMONIA NITROGEN LOSSES FROM SIMULATED PLOWING OF NATIVE SODS. *Soil Sci. Soc. Am. Proc., 37(2):247-249, March/April 1973. 14 refs.*

The purpose of this research was to measure ammonia gas evolved by volatilization from soils that have recently been broken from the native sod condition. Methodology for measuring NH3 losses under simulated natural environments is presented. Two moisture levels, field capacity, and wilting point were studied. The NH3 volatilization was not a significant loss mechanism in the first 160 days after cultivation began. (Author abstract)

30610 **APTIC NO. 53223**

Horompoly, Imre

INTERNAL COMBUSTION ENGINE-GENERATED AIR POLLUTION AND SOME WAYS OF ITS ABATEMENT. *(Belsoegesu motorok levegoszennyezese es a csokkentes nehany modja). Text in Hungarian. Jarmuvek, Mezogazd. Gepek, 20(4):151-157, 1973.*

Biological effects on internal combustion engine-generated air pollutants, such as carbon monoxide, nitrogen oxides, aldehydes, polycyclic hydrocarbons, lead compounds, gasoline vapors, soot, and sulfur dioxide, as well as tentative and practical solutions to their control are reviewed. The maximum allowable daily concentrations in the air of CO, hydrocarbons, aldehydes, nitrogen oxides, and sulfur dioxides in Hungary are 0.9; 0.39; 0.01, 0.045, and 0.06 ppm, respectively. Due to its irreversible carcinogenic effect, 3,4-benzopyrene has no allowable concentration. Positive crankcase ventilation, reducing the power output by 10%, thermal afterburning of the exhaust gases, requiring temperatures of 900 to 1000 C, and increasing the gasoline consumption by 15 to 20%, catalytic afterburning, preliminarily for the abatement of hydrocarbon and CO emissions, mixture optimization, development of new combustion chamber designs, and the use of specific emission control additives are among the basic measures for the control of harmful exhaust components.

30611 **APTIC NO. 52747**

Horvath, Z.

GENERAL DEVELOPMENT TRENDS IN NON-FERROUS METALLURGY. *(Allgemeine Entwicklungslinien in der Nichteisenmetallurgie). Text in German. Metall. (Berlin), 27(8):761-767, 1973. 11 refs.*

Metallurgy and with it nonferrous metallurgy has grown rapidly in the last 50 years. The reasons for this tremendous growth are the ever increasing demand by industry for more metals, the demand for better metals, the necessity for the development of new technologies for treating new raw materials, and finally the influence of laws for the protection of the environment. Smaller metallurgical plants were taken out of operation and in larger ones new technologies were developed to meet regulations concerning air and water pollution. Legal regulation had become necessary because air and water pollution by metallurgical plants had reached catastrophic proportions. In the United States, for instance, copper plants emitted 1.47 million tons of sulfur in 1969, zinc plants 0.32 million tons, and lead plants 0.13 million tons. In the same year, only 30.7% (0.85 million tons) of the sulfur emitted by these plants was recovered in the form of sulfuric acid, liquid sulfur dioxide, or elemental sulfur. New technologies and methods are briefly described of which bacterial leaching or pressure deserves special mention because no SO2 is emitted.

30612 **APTIC NO. 53303**

Ishida, Takara

CONTROL MEASURES ON AIR POLLUTION WITH NITROGEN OXIDES. *(Chissosankabutsu no taikiosen taisaku). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 2(7):468-484, July 1973.*

Nitrogen oxides concentrations in Japan, sources, their percentages of contribution to the total NOx emission, the environmental criteria, measurement and control methods, and emission criteria are discussed. The atmospheric concentration of NOx is increasing each year in most parts of the country; 0.037 ppm in 1968 to 0.041 ppm in 1971 at Sapporo, Hokkaido; 0.031 to 0.058 at Kasumigaseki, Tokyo; and 0.021 to 0.039 at Osaka. Automobiles accounted for 34.8% of the total NOx emission estimated at 200,200 tons in 1965, power generation for 26.9%, petroleum industry for 4.1%, other industries for 31.3%, commerce and household for 2.1%, and incineration of waste matters for 0.7%. Of 443,800 tons of NOx emitted in 1970, automobiles accounted for 173.0 tons or 39.0%, power generation for 95.4 tons or 21.5%, petroleum industry for 22.6 tons or 5.1%, other industries for 137.6 tons or 31.0%, commerce and household for 11.4 tons or 2.6%, and incinerators for 3.6 tons or 0.8%. The new environmental criteria for nitrogen dioxide and photochemical oxidant recently announced by the Japan Environmental Agency are introduced. They are 0.02 ppm or less daily average of 1-hour values for NO2 and 0.06 ppm or less 1-hour values for oxidant. The four categories of air pollution, Level I through Level IV given by the Guides to Air Quality in the 1963 World Health Organization Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement report are introduced. The environmental criteria for air pollutants are compared among various countries of the world. Representative NOx control methods include low excess air combustion, exhaust gas recirculation, catalytic reduction, and absorption. Automotive emission criteria for NOx for various countries are also introduced.

30613 **APTIC NO. 53522**

Jones, Julian W. and Richard D. Stern

WASTE PRODUCTS FROM THROWAWAY FLUE GAS CLEANING PROCESSES - ECOLOGICALLY SOUND TREATMENT AND DISPOSAL. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., 47p., 1973. 13 refs. (Presented at the Environmental Protection Agency, Flue Gas Desulfurization Symposium, New Orleans, La., May 14-17, 1973.)*

The application of lime/limestone throwaway processes and the neutralization of unmarketable abatement sulfuric acid will create large quantities of wet sludge consisting of fly ash or oil soot, plus sulfonated and unsulfonated calcium salts, impurities, and trace elements. Ponding and landfill are the two major techniques employed for the disposal of this sludge; both of these methods offer potential disadvantages, particularly in the form of water pollution. Although utilization of the sludge is desirable in the long run, current research must practically be directed toward the improvement of treatment/disposal technology. An EPA program to determine ecologically and economically acceptable methods for sludge disposal is described. The program involves: the physical and chemical characterization of sludge materials from representative sorbent/fuel combinations; an evaluation of potential water pollution and other problems associated with the disposal of both treated and untreated sludge; and a study of the economics of various disposal/treatment combinations. Preliminary findings regarding the nature of treated and untreated sludge are reported, along with early findings concerning the use of various treatment and disposal methods. Some preliminary economic data are also presented. (Author abstract modified)

30614 **APTIC NO. 52664**

Kanamaru, Go, Hirohisa Shima, Takaetsu Matsui, and Tamaki Hashizume

AN EXAMPLE OF ATMOSPHERIC POLLUTION BY FLUORIDES. *(Hukkabutsu ni yoru taiki osen no ichirei ni tsuite). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 1:134-137, March 1973. 6 refs.*

A ceramic plant emitted hydrogen fluoride gas which caused silkworms raised nearby to die, show poor growth, or stop preparing cocoons. Hydrogen fluoride from another ceramics plant in another city caused damage to cedars and pines. Hydrogen fluoride in these areas was collected on a filter paper, extracted with distilled water, and determined colorimetrically. Sulfur dioxide and phenol were simultaneously determined by the rosaniline formalin method and 4-aminoantipyrin method, respectively. The highest HF value in the first city in 1970 was 78 micrograms/day/100 sq cm. After the detection of this high concentration, a jet scrubber replaced a water spray as the air treatment method. In the second city, the highest HF value was 58.3 micrograms/cu m; the highest SO2 concentration was 0.70 ppm; the highest phenol concentration was 0.156 ppm.

30615 **APTIC NO. 53231**

Kaneko, Mikihiro

MEASUREMENT OF CYANIDE CONCENTRATION IN AUTOMOBILE EXHAUST GASES, STACK GASES, AND ENVIRONMENT. *(Jidosha haishutsu gasu, nensho haigasu ganyu shian to seikatsukankyo chu no shian nodo ni tsuite). Text in Japanese. Kankyo Sozo (Environ. Creation), 3(7):2-8, July 1973. 1 ref.*

Cyanide concentrations in automobile exhaust gases measured by the ion electrode method were 2.6, 6.5, 12, and 18 mg/cm m at idling, 40 km/hr, 60 km/hr, and 80 m/hr driving conditions, respectively. A catalytic converter with 50-90% efficiency effectively removed the cyanide. Slow engine adjustment also reduced cyanide from 13 mg/cu m at 9.5 carbon monoxide % to 2.6 and 1.4 mg/cu m at 5.1 and 1.5 CO %. The CN concentration in garbage combustion stack gases was 5.6-9.5 mg/cu m during imperfect combustion and 0.3-1.3 mg/cu m with perfect combustion. Garbage should be burned slowly and perfectly to decrease CN. The CN concentrations from boilers were below detectable levels. Cyanide ranged from below 0.0025 mg/cu m (undetectable) to 0.005 mg/cu m at an intersection; it ranged from below 0.0025 mg/cu m to 0.009 mg/cu m near a cork furnace. Cyanide concentrations were below 1/2000 and 1/1000 of the permissible concentration (10 ppm or 11.6 mg/cu m).

30616 **APTIC NO. 53486**

Laskowski, Wladyslaw

INTERNAL COMBUSTION ENGINE--POWERED VEHICLES AS A SOURCE OF AIR POLLUTION. *(Pojazdy napedzane silnikami spalinowymi jako zrodlo zanieczyszczen powietrza atmosferycznego). Text in Polish. Chemik (Gliwice), 26(2):108-113, 1973. 11 refs.*

The estimated increase in the number of internal combustion engine vehicles in Poland, kinds of air pollution caused by the latter, their noxious effect upon the environment, and the complexity of the environmental protection problems posed by this type of vehicle are discussed. The number of internal combustion engine-powered vehicles doubles every 6 years in Poland. In the competition between internal combustion engines and electrical ones, the first will be still in use in the near future. Tables showing the period of time necessary for doubling the production of internal combustion engine vehicles are given. The leading countries are: Japan, Italy, Austria, Spain, Holland, West Germany, and Poland. In the United States the number of cars was 30,000,000 in 1938. In 1940, with 35,000,000 vehicles, the coefficient for the United States was 3.7 vehicles/l sq km. In Poland, this coefficient was 2.1, in 1969. This coefficient will be exceeded in 1975. The pollution load considered satisfactory in 1973 and 1975 will be no longer satisfactory in 1980, since 50% of the population of Poland live in cities. This index is increasing, and will become 85 to 90%. Pollution will mostly affect central and southern mountaineous resorts. An analysis is made of the emission gases, products of complete combustion, such as carbon monoxide, products of incomplete combustion, such as nitrogen oxides, hydrocarbons, and sulfur oxides. Research results indicated that no internal combustion engine will ever be completely free of noxious pollutants. Emissions must therefore be controlled by reactors and absorbers. The combustibles industry should produce non-sulfurous fuel and replace lead compounds by nonpoisonous substances. Not only technical measures must be adopted, but also complex planning of cities, streets, parking, and highways, especially during night inversion. Diesel motors should be abandoned, since they cause most air pollution.

30617 **APTIC NO. 53089**

Mantle, E. C.

THE SECONDARY METALS INDUSTRY AND THE ENVIRONMENT. *Clean Air, 3(10):24-29, Summer 1973. 11 refs.*

Potential emissions from the secondary metals industry comprise dust and fine metallic particles, smoke, fume, and volatile chlorides and fluorides. The industry was calculated to contribute 127,000 tons of particulates per year. With some processes (e.g., reclaiming scrap copper cable and recovering machine shop swarf and borings) it is common to pretreat the materials to reduce the pollution problems in subsequent melting. Within the copper industry emissions are controlled by dispersal of the fume through tall stacks on the furnaces or by collection of the fume, usually in baghouses. Arrestment plants are used to control the fume arising from the use of fluxes based on sodium chloride in the secondary aluminum industry. Other sources of pollution in this industry are reduction of the magnesium contents of melts, painted or lacquered scrap, fume from salt fluxes, and secondary aluminum alloy production. Emission problems are reduced via the use of reverberatory furnaces with side wells, wet collection with venturi scrubbers, and collection by irrigated electrostatic precipitators. In the lead industry, fume extraction hoods, collection in baghouses, and venturi type wet scrubbers are used to control emissions. There appears to be no serious emission problems in the zinc industry. Since pollution control measures are usually costly, attempts have been made to avoid pollution at its source. For example, the Derham process has been developed to reduce the emissions from chlorination treatments to remove magnesium within the secondary aluminum industry. The copper industry is also giving attention to in line refining treatments for the removal of elements such as tin and lead; these treatments reduce the volume of emissions to be handled. The emission problems associated with remelting swarf and borings may be reduced by replacing oils with water based cutting fluids.

30618 **APTIC NO. 52680**

Miyajima, Kunio, Misao Kawai, Shinzo Hirasawa, Masaaki Oya, and Tsuyoshi Yamada

A STUDY ON THE TECHNIQUES OF PREVENTING NOX EMISSIONS FROM FIXED COMBUSTION EQUIPMENT - (NO. 4) THE EFFECT OF NITROGEN PRESENT IN FUEL. *(Kotei nenshosochi kara sankachisso boshi gijutsu ni kansuru Kenkyu - (Dai 4po) nenryochu no chissobun no eikyo). Text in Japanese. Preprint, Japan Society of Chemical Engineering, Tokyo, p. 170-172, 1973. (Presented at the Japan Society of Chemical Engineering, Study Meeting, Niigata, Japan, July 19-21, 1973.)*

The effect of nitrogen content in fuel on the amount of nitric oxide produced, the rate of conversion of nitrogen into NO, and the effect of nitrogen and the oxygen partial pressure on the NO concentration were experimentally studied. Pyridine and quinoline were used as nitrogen compounds in light oil with 02, 0.35, and 0.5% nitrogen contents. There was no relationship between nitrogen content in fuel and NO. There was no difference in the amount of No emitted due to the kind of fuel. When the air ratio (oxygen partial pressure) was 1.1, the maximum conversion rate of nitrogen compounds into NO was 90%, regardless of the nitrogen content; the change in the air ratio also changed the conversion rate.

30619 **APTIC NO. 52892**

Miyake, Masataka, Shigeichi Okada, Yoshitaka Kawahara, and Katsutoshi Asai

NEW STRATIFIED CHARGE COMBUSTION SYSTEM (MCP) FOR REDUCING EXHAUST EMISSIONS. *(Haiki seijoka no tame no atarashii sojo kyuki nensho hoshiki -MCP- no kenkyu). Text in Japanese. Mitsubishi Juko Giho (Mitsubishi Heavy Ind., Tech. Rev.), 10(3):360-369, May 1973. 5 refs.*

The Mitsubishi Combustion Process (MCP) engine was developed to make the engine operate under lean mixture and thus minimize toxic exhaust emissions. The effects of lean mixture combustion on the exhaust were examined by varying air-fuel ratios, cycle combustion temperatures, and effective heat ratios. The result confirmed that the exhaust gas from the MCP engine is much cleaner than normal engines. When using a jet nozzle and injection is adjusted to 48 deg (BTDC), the concentration of hydrocarbons is 100 ppm, carbon monoxide is 1%, and nitric oxide is 350 ppm. To reduce NO, the air-fuel ratio must be controlled so that the initial combustion speed is restricted. By using a small jet nozzle, NO emission can be reduced to about 1/10 the amount of the emission of a carburetor engine. With the MCP engine, the jet timing has little effect on the performance, but it affects the emission of HC and NO; by delaying jet charging, the emission concentration can be reduced a great deal. All types of fuels are applicable to this engine; the initial charge is easy at a low temperature; and fuel consumption is economical.

30620 **APTIC NO. 52684**

Miyamoto, Isao, Sachio Inada, Minoru Ishizaka, and Shuichi Okumura

EXAMINATION AND MEASUREMENT OF THE OFFENSIVE ODOR DUE TO SULFUR OXIDES. *(Ioukagobutsu ni yoru akushu no jittai chosa oyobi sono sokuteiho). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(7):733-739, July 1973. 3 refs.*

Bad odors in Toyama Prefectures were measured, especially at major odor sources including a kraft pulping factory and a poultry farm. Hydrogen sulfide, methyl mercaptan, and methyl sulfide were measured at the kraft pulping factory. The odors were sampled in a sampling bottle, absorbed into a concentrating tube, and analyzed by gas chromatography with a flame photometer and gas chromatography with a flame ionization detector.

30621 **APTIC NO. 52904**

Noda, Takao

GASOLINE-ENGINES. *(Gasorin enjin). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 27(6):608-616, June 1973. 6 refs.*

Several automotive exhaust controls are described including American Motors exhaust gas recirculation system. A 13% recirculation rate achieves 50% or more nitrogen oxides reduction compared with similar unequipped 1972 models. To prevent excessive thickening of the air/fuel mixture at cold start, all carburetors of American Motors cars were equipped with an electrically assisted quick-opening choke mechanism to reduce carbon monoxide by 50%. The 1973 American Motors car has an air cleaner which takes in intake air whose temperature is controlled by thermostats and a transmission controlled spark system. Chrysler uses exhaust gas recirculation which reduces nitrogen oxides. The choke mechanism using the electric assist heating coil is also adopted in Chrysler models. Ford and General Motors are also using the recirculation system. Japanese engine modifications to avoid adverse effects such as valve recession are discussed. The Compound Vortex Controlled Combustion system developed by Honda and the Rotary Engine Anti-Pollution System are described.

30622 **APTIC NO. 53010**

Norco, J. E., R. R. Cirillo, T. E. Baldwin, and J. W. Gudenas

AN AIR POLLUTION IMPACT METHODOLOGY FOR AIRPORTS - PHASE I. (FINAL REPORT). *Argonne National Lab., Argonne, Ill., Center for Environmental Studies, Office of Air and Water Programs Contract IAG-0171(D), Rept. ANL/ES-22, Pub-APTD-1470, 312p., Jan. 1973. 47 refs.*

NTIS: PB 220987

It has been demonstrated that large airports have a direct impact on environmental quality as a result of aircraft operation, and an indirect impact by providing a focal point for urban development and industrialization. This report reviews the air pollution impact of an airport and its environs. A methodology is presented for integrating the air pollution impact of an airport and its associated ground-support activities with that of the induced urban development in its vicinity, to provide a quantitative basis for decisions related to airport site selection and for the development of land surrounding the site. Procedures for estimating airport-related air pollutant emissions are defined. The flexible impact methodology is achieved through a general protocol for identifying, isolating, and quantifying an array of airport related and urban activities which provide environmental insults. The procedures are general and applicable to either existing or proposed airport facilities. The methodology was developed and field tested using data from the proposed St. Louis Airport at Waterloo/Columbia, Illinois, from the Chicago O Hare International Airport and from several other existing facilities. (Author abstract modified)

30623 **APTIC NO. 53230**

Otsuka, Kenichi

ENVIRONMENTAL PROBLEM AND SUBJECTS OF IRON MANUFACTURING TECHNOLOGY IN JAPAN. *(Kankyo modai to nippon no seitetsu gijutsu no kadai). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(4):509-513, Sept. 1973. 5 refs.*

Nitrogen oxides and dust are emitted by various processes in the steel industry. Discontinuous processes or unsteady processes in the blast furnace and converter can cause dust. The coke oven can also produce dust. Sulfur oxides and nitrogen oxides from sintering furnaces are a large problem. Operating variables which cause pollutant formation are discussed.

30624 **APTIC NO. 53382**

Penn, F. W. and W. F. Marshall

EMISSION CHARACTERISTICS OF AN AIRCRAFT AUXILIARY POWER UNIT. *Bureau of Mines, Bartlesville, Okla., Bartlesville Energy Research Center, RI 7735, 13p., 1973. 8 refs.*

An aircraft auxiliary power unit (APU) was used as an exhaust source for evaluation and refinement of sampling and analytical procedures for gas turbine engines. The unit was also used to determine the emission characteristics of APU s in service and to study the effect of fuel composition and combustor design on exhaust emissions. Carbon monoxide, carbon dioxide, oxides of nitrogen, hydrocarbons, aldehydes, particulate loading, and odor were measured at engine operating modes representing the duty cycle encountered in airline operation. Analyses showed good repeatability, and adequate sensitivity was attained in these experiments. Smoke opacity measurements were not taken owing to the lack of a high-sensitivity smokemeter. Results showed that the minimum emission levels occurred with the standard combustor and Jet A fuel. Emission rates were highly dependent on test mode, but emission patterns as a function of test mode were similar for all fuels and combustors tested. A comparison of three identical design production combustors showed a variation in average emission rates of less than 5%. (Author abstract)

30625 **APTIC NO. 52694**

Peterson, Richard H. and Mark H. Waters

HYPERSONIC TRANSPORTS - ECONOMICS AND ENVIRONMENTAL EFFECTS. *J. Aircraft, 10(6):334-341, June 1973. 27 refs.*

An economic analysis of hypersonic transports is presented to show projected operating costs (direct and indirect) and return on investment. Important assumptions are varied to determine the probable range of values for operating costs and return on investment. The environmental effects of hypersonic transports are discussed and compared to current supersonic transports. Estimates of sideline and flyover noise are made for a typical hypersonic transport, and the sonic boom problem is analyzed and discussed. Since the exhaust products from liquid hydrogen-fueled engines differ from those of kerosene-fueled aircraft, a qualitative assessment of air pollution effects is made. (Author abstract)

30626 **APTIC NO. 52870**

Ploetz, Th.

ENVIRONMENTAL BURDEN BY THE PULP AND PAPER INDUSTRY. *(Umweltbelastung durch die Zellstoff- und Papierindustrie). Text in German. Papier (Darmstadt), 27(5):181-187, May 1973.*

Data which give a comprehensive survey of relevant facts pertaining to the environmental situation in Europe, are presented. Based on the situation in 1970, the effluent load as well as the technological and financial expenditures for its decrease were examined, and the production development for the various ranges of products was projected for the years 1975 and 1980. A cost effect comparison and a survey on cost division between industry and public institutions are given for Belgium, Finland, France, Norway, Spain, Sweden, Austria, Switzerland, Great Britain, the Netherlands, and Italy.

30627 **APTIC NO. 52797**

Rawdon, A. H. and R. S. Sadowski

AN EXPERIMENTAL CORRELATION OF OXIDES OF NITROGEN EMISSIONS FROM POWER BOILERS BASED ON FIELD DATA. *J. Eng. Power, 95(3):165-170, July 1973. 8 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, Nov. 26-30, 1972, Paper 72-WA/Pwr-5.)*

A brief review of the kinetic formation of nitrogen oxides is presented. A distinction was made between thermal NOx and fuel nitrogen NOx. The correlation of results is based both on data from literature and field data from Riley Stoker s Air Pollution Study Program. The emission of NOx was shown to be capable of correlation based on fuel nitrogen, excess air, fuel, burning area heat release, combustion air temperature, furnace wall deposits, and furnace type. The results correlated to a standard deviation of 60 ppm. Based on the above studies, the development of new NOx abatement techniques is considered, including flue gas recirculation, off-stoichiometric firing, low-excess air firing, low temperature air, and furnace cooling.

30628 **APTIC NO. 53406**

Rhodes, William J.

POTENTIAL POLLUTANTS IN COAL AND THE ENVIRONMENTAL IMPACT OF COAL GASIFICATION. *Preprint, American Inst. of Chemical Engineers, New York, 13p., 1973. 2 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 74th, New Orleans, La., March 15, 1973.)*

The potential impact of coal gasification methods on the environment and on pollution control was studied. The sulfur content of raw coal within the United States ranges from 0.2 to 12.0%, and varies from region to region. Trace elements such as beryllium, fluorine, mercury, arsenic, selenium, cadmium, lead, boron, uranium, zinc, chromium, cobalt, and tin are also found. Most of these are present in coal in the 1 to 100 ppm range, with the most common concentration being 5 to 10 ppm. The average concentrations of boron and fluorine are significantly higher, while those of beryllium and mercury are considerably lower. With the total number of trace elements which are potential pollutants, the coal gasification complexes have the potential for significant environmental pollution. In addition, the mining, transportation, pretreatment, and gasification processes generate numerous other potential pollutants. The air pollutants include sulfur oxides, nitrogen oxides, total suspended particulates, fine particles, carbon monoxide, hydrocarbons, toxicity, odor, and thermal pollution. There are also numerous potential water and solid waste pollutants, and the processes present other possible environmental problems such as noise and the endangering of animal species and ecosystems. The nature and magnitude of the pollution problems will depend on the coal to be used, its sizing, the disposition of unsuitable coal, the controls to be used, the disposition of fumes and dust, and the method, if required, of coal drying. The potential problems must be faced now if viable acceptable systems are to be available when needed in the future.

30629 **APTIC NO. 52742**

Riedlinger, Rudolf A.

THE INCINERATOR IN DUESSELDORF. DESIGN AND FIRST OPERATING EXPERIENCE WITH THE FIFTH

INCINERATOR/STEAM BOILER UNIT. (Muellverbrennungsanlage Duesseldorf Konstruktion und erste Betriebserfahrungen mit dem 5. Muellverbrennungs-Dampfkessel). Text in German. Energie Tech., 25(6):145-147, June 1973.

The incinerator in Duesseldorf received a fifth unit which was taken into operation in Sept. 1972. It has been designed for a throughput of 12 t/hr, an average heating value of the wastes of 2000 kcal/kW, a steam capacity of 30 t/hr, a steam temperature of 500 C, a steam pressure of 95 atm, and a waste gas temperature of 250 C. The design of the fifth incinerator was determined by the considerably larger fraction of volatile components in the refuse. Between the combustion chamber and the entrance to the radiation flue of the boiler a long path for final combustion of the gases has been created by installation of a ceiling which returns the flue gases to the sixth roller. Here the gas is deflected into opposite direction and passed into the radiation flue. Moreover, injection of secondary air was necessary. The injection point was found by water tank model studies. Instead of the mechanical feeder of the four other incinerators, the fifth received a hydraulically operated feeder. The plate superheater and the contact heating surfaces have been divided. Operating experiences have shown that the design values for the steam capacity and the refuse throughput are being met. After 5000 operating hours, corrosion was observed near the combustion chamber ceiling because of the reducing atmosphere. Due to the high temperatures and the lining in the vicinity of the extra ceiling, incrustations occurred which had to be removed manually. The lining was changed and secondary air was blown in near the combustion chamber ceiling.

30630 **APTIC NO. 53258**

Rolker, J.

STUDIES INTO THE SULFURIC ACID DEW POINT DETERMINATION IN FLUE GASES. *(Untersuchungen zur Schwefelsaeure-Taupunkt- Bestimmung in Rauchgasen). Text in German. VGB Kraftwerkstechnik, 53(5):333-339, May 1973. 16 refs.*

The accurate determination of the sulfuric acid dew point in connection with the combustion of sulfur-containing fuel gases is described. Important factors which influence the formation of sulfur trioxide (SO3) include: sulfur content of the fuel, the quantities of air in the boiler, temperature of the fuel gases, length of time the flue gases remain in the boiler, the quantity and distribution of the metal oxide catalysts, and the quantity and distribution of additives. The electrical measurement of the dew point is effected by measuring the acid film by means of the resistance produced between two electrodes, this film being formed on an originally dry surface. A number of instruments, used for such measurements, are delineated. An experiment is described whereby the various factors affecting the dew point measurement were taken into consideration. A mixture of air, water, sulfur dioxide and SO3 was tested under laboratory conditions and shown to yield reproducible results. The acid film, formed in the course of measurement, was observed under a microscope and photographed. The main features of an instrument for dew point measurement are described.

30631 **APTIC NO. 53324**

Scheers, A. H.

SAFETY SYSTEMS AND AIR POLLUTION. 5. *(Veiligheidssystemen en luchtverontreiniging. 5). Text in Dutch. Polytech. Tijdschr., Ed. Procestechniek (The Hague), 28(10):307-312, May 1973.*

Problems involved in the operation of blow-off torches, and methods for the calculation of the flame diameter and length, the heat generation, and the emissivity factor of the heat radiation are described. Stable flame during eruptions, and maximum values imposed on ground-level gas concentrations, ground-level temperature increments, and ground-level heat radiation are the basic requirements to be observed in the design and operation of blow-off torches. The flare tip diameter should be designed for a maximum Mach value of 0.2 to 0.3, which should be reduced to or below 0.1 for gases with calorific values less than 8300 KJ/kg. The heat radiation is calculated on the basis of the Stefan-Boltzmann law, assuming a flame temperature of 1950 C. The radius of the required safety zone around blow-off torch, corrected with respect to wind speed, is determined. A comparison of the Kent, API (American Petroleum Institute), and Reed and Heitner methods for the calculation of the flame height shows the nonavailability at the present time of satisfactory formula for the determination of the flame length. Formula for the determination of the flame emissivity for different gases is given. The use of steam to achieve smokeless combustion results in increased heat flux density.

30632 **APTIC NO. 53325**

Scheers, A. H.

SAFETY SYSTEMS AND AIR POLLUTION. 7. *(Veiligheidssystemen en luchtverontreiniging 7). Text in Dutch. Polytech. Tijdschr., Ed. Procestechniek (The Hague), 28(12):398-403, June 1973.*

The complex problem of the design of blow-off torches for gaseous hydrocarbons is treated on the basis of two examples of emergency blow-off, using the conventional and the modern methods of calculation. For a hydrocarbon with a molar weight of 100 and 100 C temperature, the flare tip diameter is calculated with respect to the critical gas flow rate and to the discharge rate, and the flame length is determined from the expected amount of heat. The torch height is calculated from the maximum allowable ground-level heat flux density, from which a safety zone radius is obtained. The safety zone diameter is corrected for a wind speed of 20 m/sec. The temperature increment occurring at ground-level due to torch operation is determined. The steam expenditure necessary to abate smoke emission is calculated. Smokeless combustion is not required for emergency blow-off. The design of a torch for burning natural gas for which the use of steam is not required is described, as performed by the conventional and the modern method, permitting discharge rates exceeding 0.2 Mach.

30633 **APTIC NO. 53055**

Sechenov, G. P., V. S. Alt shuler, and L. D. Leonova

GENERATION OF TECHNICAL HYDROGEN BY STEAM CONVERSION OF GASEOUS HYDROCARBONS IN CATALYST FLUIDIZED BED UNDER PRESSURE. *(Polucheniye tekhnicheskogo vodoroda parovoy konversiyey uglevodorodnykh gazov v psevdoozhizhennom sloye katalizatora pod davleniyem). Text in Russian. Khim. Prom. (Moscow), no. 5:384-387, 1973. 4 refs.*

The efficiency of hydrogen generation by steam conversion of methane, other gaseous hydrocarbons, and carbon monoxide in catalyst fluidized bed under pressure was studied. The heat absorbing surfaces were placed within a fluidized bed of 1-2 mm refractory granules to increase heat exchange, necessary for hydrogen generation. A 0.4-1 mm fraction of GIAP-3 type catalyst was used for methane conversion, and an identical fraction of iron-chromium catalyst for CO conversion. Process for the two-stage conversion of methane and other gaseous hydrocarbons into hydrogen without intermediary cooling and carbon dioxide removal was developed. The temperature at the end of the combustion chamber and in the converter was in the respective ranges of 1050-1160 C and 940-980 C. Pressures of 20 and 40 at were adopted. With the pressure being the same, the CO conversion temperature was 500-520 C. The efficiency of the methane conversion ranged from 98.5 to 99%, and that of CO conversion from 56 to 70%. The admixture of hydrogen to the initial gaseous mixture led to a certain decrease in the rate of conversion.

30634 **APTIC NO. 53265**

Seki, Toshihiko, Koshi Abe, Hidehiko Hoshikawa, Yasuko Inoue, Norio Kaitani, and Shikaji Kondo

ON POLLUTION OF STREET SOILS WITH HEAVY METALS FROM AUTOMOTIVE EXHAUST GAS. *(Jidosha haikigasu ni yoru gairodojo no jukinzokuosen ni tsuite). Text in Japanese. Koshu Eisei (Public Health), 37(8):561-563, Aug. 1973. 8 refs.*

Heavy metals in the soil near a main street in downtown Sendai city and in the soil of a suburban area with hardly any traffic were measured. Lead concentrations in the main street soil were 164 ppm maximum and 158 ppm average, compared with 24 ppm and 19 ppm, respectively, in the suburban area soil. Lead content of suburban soil was practically the same for both top soil and that at 20 cm depth; lead content of main street soil at 20 cm was 97 ppm, indicating possible lead accumulation. The main street soil also contained two-three times more cadmium, copper, and zinc than suburban soil. No difference in manganese and iron occurred between the two localities. Roadside soil contained 279 ppm of lead on the average while soil 70-100 m away from the road contained 65 ppm. This indicates that lead from automobile exhausts primarily accumulates in the roadside soil.

30635 **APTIC NO. 53030**

Shendrikar, A. D. and Philip W. West

DETERMINATION OF SELENIUM IN THE SMOKE FROM TRASH BURNING. *Environ. Letters, 5(1):39-35, 1973. 6 refs.*

Smoke from open trash burning was analyzed for selenium content. Selenium (as its oxides) was trapped by impingement in distilled water and determined by a methylene blue catalytic method. The selenium content of the smoke was related to the content of the trash. Concentrations of selenium dioxide were as high as 273 micrograms/cu m when dry wood chips were burned. The reaction of selenium oxides in humid atmospheres and in moist tissues of the respiratory tract forms selenic or selenious acids which are health hazards. Selenium was also found in cigarette smoke. (Author abstract modified)

30636 **APTIC NO. 52855**

Siccama, E. H.

THE ENVIRONMENTAL RISK ARISING FROM THE BULK STORAGE OF DANGEROUS CHEMICALS. *Ingenieur, 85(24):502-505, June 14, 1973. 2 refs. (Presented at the Afdelig voor Gezondheidstechniek of KIVI, Jan. 12, 1973.)*

A theoretical analysis of dangers involved arising from bulk storage of dangerous chemicals is given. A method for an approach to tackle the problem of storage of dangerous liquids and the problem of the distance from residential areas is given. Since sufficient information for statistical calculations are lacking, only the order of magnitude can be indicated. To improve the accuracy of this method it will be necessary to collect the information on large incidents on a world-wide basis.

30637 **APTIC NO. 53295**

Singh Dev, R., K. Kautz, and H. Kirsch

THE BINDING OF TRACE ELEMENTS, ESPECIALLY FLUORINE, BY ASHES AND DUSTS RESULTING FROM REFUSE INCINERATING PLANTS. *(Die Einbindung von Spurenelementen, insbesondere des Fluors, in Aschen und Staeuben von Muellverbrennungsanlagen). Text in German. VGB Kraftwerkstechnik, 53(6):408-414, June 1973. 9 refs.*

The incorporation of fluorine and other trace elements in the ashes and flue gases which result from the incineration of refuse is described. Analyses of samples of house and city refuse and of industrial sweepings are presented. Samples were obtained from various areas in the combustion chamber of the incinerators and from the flue pipes and were subjected to the following analyses: ashes were analyzed chemically for trace elements; all samples were subjected to a roentgenographic phase analysis; and samples with high fluorine content, usually fine particulate matter which filtered through the electrofilter, were analyzed by means of the electron microscope and with the aid of electron rays. The chemical analysis revealed that the ashes and other products of incineration differed considerably from the raw refuse and that the products of combustion interacted among themselves. Both chlorine and fluorine were found in sediments of dust when the temperature of the smoke was below 600 C. Fluorine was particularly concentrated in the particles in the electrofilter, most frequently occurring as calcium fluoride. Sodium fluoride was relatively rare, occurring only in industrial incinerator sediments.

30638 **APTIC NO. 52741**

Singh, R., K. Kautz, and H. Kirsch

THE PRESENCE OF TRACE ELEMENTS, PARTICULARLY OF FLUORINE IN ASH AND DUSTS OF INCINERATORS. *(Die Einbindung von Spurenelementen, insbesondere des Fluors, in Aschen und Staeuben von Muellverbrennungsanlagen). Text in German. VGB Kraftwerkstechnik, 53(6):408-414, June 1973. 9 refs.*

Seven samples from domestic and communal refuse incinerators and eight samples from industrial incinerators were obtained. From each incinerator several ash samples from the combustion chamber and from the flue gas ducts through the boiler to the electrostatic precipitator were taken. The fluorine concentration in the ash samples was determined by water vapor distillation and subsequent determination of the formed hexafluoride (H_2SiF_6) silicic acid in the distillate by a specific electrode. The elements aluminum, barium, calcium, cobalt, chromium, copper, potassium, lithium, magnesium, manganese, molybdenum, sodium, nickel, lead, antimony, vanadium, and zinc, were determined by atomic absorption spectrophotometry. Phosphorus and iron were determined by photometry, silicion and sulfur by gravimetry, and chlorine by titration. The analyses indicated that both chlorine and fluorine enrich in depositions and the dust at a drop of the flue gas temperature to below 600 C. The fluorine enrichment is highest in the dusts from the electrostatic precipitator. This indicates that the hydrogen fluoride of the flue gas is bound to the dust particles. Of the fluorine compounds, most frequently calcium fluoride was found, whose low solubility is 0.16 g/l water at 20 C. The sodium fluoride was found only in samples from industrial incinerators. In the incinerators equipped with travelling grates, the binding of fluorine in the form of CaF_2 is low because the ash remains in the combustion zone for a long time at high temperature. Most of the fluorine is bound in the electrostatic precipitator.

30639 **APTIC NO. 53394**

Smith, Allan F. and Joseph M. Kuchta

TOXIC PRODUCTS FROM BURNING OF FIRE-RESISTANT MATERIALS. *Bureau of Mines Health and Safety Program TPR 66, 22p., Feb. 1973. 7 refs.*

The Bureau of Mines studied toxic products produced by burning eight fire-resistant mine conveyor belts, a brattice cloth, and electrical cable insulation obtained from laboratory-scale burning experiments under various air-flow conditions. Generally, carbon monoxide product concentrations for most materials were noticeably higher than the nitrogen dioxide and the hydrogen chloride levels measured; also, no phosgene was detected. Several of the fire-resistant belt samples, however, yielded HCl concentrations that were above the reported lethal level for 1/2 to 1-hour exposures, although these data were limited to flow conditons where air dilution effects were small. The belt materials that showed this behavior included samples of polyvinyl chloride, styrene butadiene, styrene butadiene blends, and a British neoprene which yielded the greatest amount of toxic vapor. Some results are also presented on the phosphoric acid concentrations that may be produced from the decomposition of ammonium dihydrogen phosphate when dispersed on a burning coal bed. (Author abstract)

30640 **APTIC NO. 53493**

Takahashi, Masakazu, Masao Yamazaki, Yoshihiro Sigeta, Yoshimasa Sakaida, and Hitoshi Nagasawa

STUDIES ON THE OFFENSIVE ODOR AND ODOR SUBSTANCES ORIGINATING FROM MANUFACTURE PROCESS FISH-MEAL, BONE-MEAL AND FEATHER MEAL. *(Kaseisho yori hassei suru akushu ni tsuite). Text in Japanese. Minzoku Eisei (Human Hyg.), 38(3):122-136, May 1973. 27 refs.*

Odors originating from the treatment of fish refuse, animal bone, and feathers at fertilizer or fodder plants were investigated. At the outlet of a dryer for treatment of fish refuse, the degree of an offensive odor was 140-300 by odorimetry and 30,000-60,000 by an injection syringe method. The degree of odor at the outlet of the water-flushing deodorization tower was 40,000 by the injection syringe method. Odor intensity at the outlet of a dryer for treatment of feathers was 200-1000 by odorimetry and 1-80 times 10 to the 6th power by the injection syringe method. The odor at the outlet of the deodorization tower consisted of feather treatment and fish bone treatment odors. Its degree was 250 by odorimetry and 120,000 power by the injection syringe method. The autoclave exhaust air was 50,000. The results at the dryer outlet for animal bone treatment were 200 for odorimetry and 60,000 for the injection syringe method. Heat-treated animal bone and autoclave emission odors were 60,000 and 40,000, respectively. Gas chromatography revealed the presence of 36-93 ppm acrolein at the fish refuse dryer, 70-352 ppm at the feather dryer, and 41 ppm at the animal bone dryer.

30641 **APTIC NO. 52732**

Varde, K. and G. G. Lucas

EMISSIONS AND SPARK PLUG LOCATION. *J. Automotive Eng., 4(3):22-23, June 1973. 9 refs.*

The effects of spark plug location on nitric oxide and hydrocarbon emissions from a spark ignition engine were studied using non-dispersive infrared analyzers. At both 1400 and 2000 rev/min, NO emissions were higher with flame initiation at either of two positions near the exhaust port of the combustion chamber than with two positions near the inlet port. Ignition close to the exhaust port produced slightly lower levels of HC in the exhaust gas for the two different engine speeds.

30642 **APTIC NO. 52941**

Vittorini, Marcello

PETROLEUM REFINERIES AND HARBORS IN ITALY. *(Raffinerie e porti petroliferi in Italia). Text in Italian. Quad. Ric. Sci., no. 74:110-127, 1973.*

Italy has become one giant refinery and the cesspool of the Mediterranean. While the refining capacity of West Germany is 113 million tons/yr, and that of France 97 million t/yr, Italy has a capacity of 147 million t/yr (1968). In 1969 the construction of two additional refineries was authorized which will add 5 million tons to the present capacity. Six more refineries are in the planning stage, bringing the total capacity to 180 million tons or 300% of domestic consumption. This proliferation of refineries has a devastating effect on air and water pollution levels especially in the Po valley and in coastal areas where people, animals, crops, and plant life suffer. The proliferation of refineries is not dictated by sound economic reasons but by greed of the oil companies. Much damage has been caused by the circumstance that the choice of locations for refineries has been left completely to their builders instead of taking into account other elements governing proper land use practices. Responsible for this state of affairs are inadequate legislation, inadequate fiscal policies (half the refineries do not pay taxes), and indifference to the environment shown by authorities. Specific proposals for the rectification of the situation are advanced.

30643 **APTIC NO. 53281**

Wahnschaffe, E.

NITROGEN OXIDES FORMATION DURING COMBUSTION OF HEAVY FUEL OIL. *(Die Bildung der Stickstoffoxide bei der Verbrennung von schwerem Heizoel). Text in German. VGB Kraftwerkstechnik, 53(4):213-218, April 1973. 6 refs.*

The production and reactions of nitrogen oxides in boilers fired by oil are described. These oxides may be produced either as the dioxide (NO2) or monoxide (NO) depending upon the temperature, the boiler load, the oxygen content of the combustion gases, and the total concentration of the firing method. Nitric oxide which is relatively harmless, is formed in an endothermic reaction promoted at high temperatures (600 C) whereas NO2 is formed from NO in a homogeneous, third order reaction, facilitated at low temperatures (200 C). The amount of nitric oxide formed at equilibrium at different temperatures for definite mixtures of nitrogen and oxygen may be measured by automatic devices. In the temperature range between 500 and 150 C, the equilibrium shifts between NO and NO2 in spite of the increase in thermodynamic stability, towards the formation of NO2, mainly due to a secondary reaction with sulfur dioxide. The amount of air fed into the oil burner is also a factor to be considered in the formation of the oxides. The various analytical methods for the determination of gases leaving the boiler are described, and results are shown graphically.

30644 **APTIC NO. 52670**

Wakuri, Yutaro, Shinsuke Ono, and Toshiro Hamatake

ON THE SURFACE DAMAGES OF EXHAUST VALVES (III) - EFFECT OF UNLEADED GASOLINE ON THE EXHAUST VALVE FACE WEAR. *(Haikiben no sonmo ni tsuite (III) - Haikiben bozamen no mamoni oyobosu muen gasorine no eikyo). Text in Japanese. Kyushu Daigaku Kogaku Shuho (Technol. Rep. Kyushu Univ.), 46(2):177-182, March 1973. 5 refs.*

The effect of octane number, lead content in fuel, and fuel composition on exhaust valve wear was studied in a four-cylinder gasoline engine. Tetraethyl lead markedly reduced the amount of wear, but only a small difference was found between leaded gasolines. Octane number and fuel composition did not affect wear. The effect of lead oxide on the high temperature oxidation of the valve was studied in an accelerated experiment in which the valve specimens were heated in an atmosphere of high temperature exhaust emissions. The amount of corrosion was larger for leaded than for unleaded gasoline. Precipitation on the valve surface increased with increasing lead content; the precipitation layer hardness was 45 kg/sq mm compared with 410 kg/sq mm of the valve surface. The exhaust valve operated under poor lubricating conditions at high temperatures when the unleaded gasoline was used, but with leaded gasoline, PbO was precipitated on the valve surface as a protective layer. The corrosive action of PbO was less than the lubricating action. Wear increased with increased temperature in the range of 670 to 720 C due to high temperature oxidation of the valve by PbO.

30645 **APTIC NO. 52876**

White, D. J., P. B. Roberts, and W. A. Compton

LOW EMISSION VARIABLE AREA COMBUSTOR FOR VEHICULAR GAS TURBINES. *J. Eng. Power, 95(3):191-198, July 1973. 4 refs. (Presented at the American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, Washington, D. C., April 8-12, 1973.)*

A unique combustor concept was developed which demonstrated the feasibility of meeting the 1976 emission standards. The integrated emissions of a typical regenerative gas turbine engine employing this combustor type were each below one-half of the levels specified by the Federal standards, when tested over a simulated driving cycle. The success of the feasibility tests for this combustor concept has led to more fundamental studies and the planned development of a prototype combustor for demonstration on the baseline gas turbine engine. The prototype combustor for the baseline engine is described together with its variable area port mechanisms which are necessary for emission control. (Author abstract)

30646 **APTIC NO. 53178**

Yamaki, Naoomi, Takaaki Kita, Takeo Takahashi, Takashi Kobayakawa, and Mamoru Sakata

ANALYSIS OF AUTOMOBILE EXHAUST. *(Jidosha haikigasu ni fukumareru busshitsu ni kansuru kerkyu - showu 46 nendo kankgocho kogai chosa kenkyu itakuri yoru kenkyu kekka hokokusho). Text in Japanese. Shimazu Hyoron (Shimazu Rev.), 30(1):41-61, 1973. 1 ref.*

Carbon monoxide, hydrocarbons, and nitrogen oxides contained in automotive exhaust were quantitatively determined for four passenger cars of two representative Japanese models using two different brands of test fuel in a running simulation test with a chassis dynamometer. The composition of hydrocarbons was analyzed by gas chromatography, and the concentrations of aldehydes were measured by colorimetry. The relation between the constitution of the exhaust gas and the state of driving could not be determined satisfactorily due to the limited number of test cars. The experiments did, however, provide useful information on the change in unsaturated hydrocarbon contents and aldehyde concentration.

30647 **APTIC NO. 53455**

Yordanov, D.

PREDICTION OF CONCENTRATION PATTERNS IN THE SURFACE LAYER UNDER BAROTROPIC AND ADIABATIC CONDITIONS. *Arch. Meteorol. Geophys. Bioklimatol., Ser. A (Vienna), 22(2-3):285-295, 1973. 9 refs.*

A method is suggested for predicting concentration patterns in the surface layer on the basis of synoptic information. Adiabatic and barotropic conditions are assumed. Formulas are derived for computing concentration distribution by continuous point, line, and surface sources depending on the numerical weather prediction data. The connection between the planetary boundary layer external and internal parameters at a steady state and horizontal homogeneity is given by the resistance law. The influence of nonstationarity is investigated through a model of Monin and Zilitinkievich showing that with the exception of the morning and evening hours, quasistationary conditions may be assumed. One of the conditions for applying the suggested formulas is that the source should not be very high so that the diffusion process proceeds in the boundary layer for the most part, i.e., source height should not be more than a few dozen meters above the earth s surface.

30648 **APTIC NO. 52661**

Yoshida, Katsumi

PRESENT STATUS OF ENVIRONMENTAL POLLUTION AND COUNTERMEASURES AGAINST THE POLLUTION IN MIE PREFECTURE. *(Mie-ken ni okeru kogai no genjo to taisaku). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 1:1-8, March 1973.*

Environmental pollution in Mie Prefecture is discussed including its history, water pollution, air pollution effects on humans, and countermeasures against pollution. Much air pollution in the Prefecture is caused by large petroleum refineries around Yokkaichi City which produce sulfur dioxide oil contamination of water, and odors. The number of patients with asthma and related diseases increased rapidly from 1959 when new factories began operation, reached a maximum in 1965 when several air pollution control methods were begun, and decreased thereafter. Photochemical oxidants are due to automobiles and solvent evaporation.

1972

30649 **APTIC NO. 52617**

Federal Power Commission, Washington, D. C., Bureau of Natural Gas

THE GAS SUPPLIES OF INTERSTATE NATURAL GAS PIPELINE COMPANIES 1970. *FPC S-216, 162p., Feb. 1972.*

GPO

The total dedicated in-ground gas reserves of 94 interstate natural gas pipeline companies declined in 1970 from 191.5 to 173.6 trillion cu ft. Production from interstate dedicated reserves increased from 13.4 trillion cu ft in 1969 to 14.1 trillion in 1970. The rate of increase was about 5.0% compared with 6.2% for the previous 7 years and 7.0% for 1968-1969. The ratio of gross change in reserves to annual production for 1970 was 0.003; in 1969 the ratio was 0.45. The volume of gas imported from Canada and Mexico in 1970, reported by seven companies accounting for 93.8% of 1970 imports, increased by 13.2% from 679.4 to 769.4 billion cu ft. A 10% decline in deliveries is projected for 1975. Average day delivery volume scheduled for 1971 is 58.4 billion cu ft. Trends in gas reserves and production, changes in gas reserves, reserves production, and gross-change-production ratios are summarized in tables and charts. Reserve and production data for the interstate pipeline companies are compared with volumes reported by the American Gas Association.

30650 **APTIC NO. 52633**

Ministerium fuer Arbeit, Gesundheit und Soziales des Landes Nordrhein-Westfalen

EMISSION INVENTORY OF COLOGNE STATE-OF-THE-ART REPORT ON A MODEL STUDY PERFORMED IN THE COLOGNE AREA FOR THE ESTABLISHMENT OF AN EMISSION INVENTORY OF AIR POLLUTANTS. *(Emissionskataster Koeln. Bericht ueber den Stand der Modelluntersuchung im Grossraum Koeln zur Aufstellung eines Emissionskatasters fuer luftverunreinigende Stoffe). Text in German. 120p., 1972. 23 refs.*

An overall emission survey nearing its completion in the Cologne area is described. Domestic heating, small-scale industry, specific industrial plants, and traffic are taken into account in setting up the emission inventory. Industrial firing equipment are responsible for 67% of the sulfur dioxide, 17% of the nitrogen oxides, and 5% of the carbon monoxide emissions. Traffic is responsible for 91% of CO, 4% of the NOx, less than 1% of the SO2 emissions, and 3.5% of all organic vapor and gas emissions. Within the domestic heating-generated emissions, CO, SO2 and NOx, are represented with 73%, 12%, and 3%, respectively. Specific emissions generated by industry, such as inorganic vapors and gases, hydrocarbons, aromatics, gasoline-derived hydrocarbons, low-boiling and high-boiling hydrocarbons, epoxides, alcohols, esters, ketones, aldehydes, organic vapors and gases, dusts generated by combustion processes, heavy metal-containing dusts, silicate-containing dusts and other dusts are surveyed, as are the specific emissions generated by the chemical, petrochemical, metal processing, and other industries. Industrial emissions are also classed with respect to the altitude of the emission sources and to different groups of pollutants. The diurnal variations in the emissions of different pollutants are mentioned. The respective shares of energy carriers used in domestic heating and small-scale industries are presented. Traffic generated emissions are surveyed with respect to the number and production years of all vehicles in use, the traffic density, and the specific emission related to fuel consumption.

30651 **APTIC NO. 52746**

THE EMISSION OF SULFUR COMPOUNDS IN THE FEDERAL REPUBLIC OF GERMANY (AND THEIR QUANTITATIVE DEVELOPMENT SINCE 1960). *(Die Emission von Schwefelverbindungen in der Bundesrepublik Deutschland (und ihre mengenmaessige Entwicklung seit 1960)). Text in German. (Ver. Deut. Ingr.) VDI Ber. (Duesseldorf), no. 186:5-60, 1972. 152 refs.*

By far the largest amount of sulfur emissions in West Germany stem from combustion processes in industry, transportation, commerce, and homes. The composition of the fuels used for combustion is of major importance for the sulfur dioxide emission. A table shows fuel consumption in West Germany and West Berlin from 1960-1970. Solid fuel consumption dropped from 55.1% in 1960 to 19.7% in 1970, while consumption of liquid fuels and gasolines rose from 23.9-56.0% over the same period. In 1970 about 77% of the solid fuels consumed were hard coals and about 23% soft coals. Sulfur concentrations in hard coals used in West Germany average 0.7-0.9%; in soft coals, 0.3-3.5%. Average sulfur concentrations in liquid fuels and gasolines are 1.55% for heavy fuel oil; 0.45% for light fuel oil; 0.4% for diesel oil; and 0.05% for gasolines. All major sources of sulfur emissions are discussed in detail including boilers, industrial furnaces of the steel and iron industry and foundries, brick kilns, lime kilns, cement works, domestic heaters, transportation (cars, boats, railroads, airplanes), agriculture, and waste incineration. A number of industrial production processes also lead to the emission of sulfur compounds. In the chemical industry, SO2 is emitted by Claus plants and in sulfuric acid production. In West Germany, the nonferrous metal industry is represented by four major plants, namely primary aluminum, copper, lead and zinc metallurgical plants. Although the total SO2 emissions of these plants is not of great importance, local damage may occur. A survey of total SO2 emissions during 1960-1970 is given for West Germany. In 1970 the total SO2 emission was 3.6 million tons, of which 1.69 million tons (94%) were emissions from combustion processes and only 0.11 million tons from various industrial processes. Among the industrial processes, iron ore sintering processes had first place with 75,000 tons of sulfur emitted followed by sulfuric acid production with 14,400 tons. Industry as a whole emittted 1.37 million tons of sulfur (76%) in 1970, domestic heating 0.37 million tons (20%), and traffic 0.06 million tons (4%). Since 1960 the total sulfur emission has risen by about 16%. Over the same period industrial production rose 74% and fuel consumption rose 61%.

30652 **APTIC NO. 53519**

Altshuller, A. P.

EFFECTS OF REDUCED USE OF LEAD IN GASOLINE ON VEHICLE EMISSIONS AND PHOTOCHEMICAL REACTIVITY. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, 28p., Feb. 1972. 20 refs.*

The reduction of the lead content of gasoline necessitates the use of other means to maintain the fuel s octane requirement; the only practical means of doing so rapidly involves increasing the aromatic content. A 10% increase in the fuel aromatic content per vehicle would result in the increased tailpipe emission of polynuclear aromatic hydrocarbons, phenols, and aromatic hydrocarbons, along with a decrease in olefins. It would also lead to increased atmospheric photochemical reactivity which would result in increased eye irritation and aerosol formation, with unchanged or decreased plant damage and ozone, peroxyacyl nitrates, and aldehyde formation. There would be a concomitant decrease in overall emissions due to the substitution of unleaded deposits for the present lead deposits. The overall effect of a change in fuel aromatics would depend on the aromatic content of each grade of fuel and the vehicle subpopulation utilizing that grade of fuel. A program for the reduction of lead in gasoline should combine optimization of the environmental impact with minimal economic cost to the community. It is recommended that one of the following lead reduction schedules be adopted: one in which a small initial increase in polynuclear aromatics (PNA) occurs, followed by a small decrease in computed PNA emissions after 1974; or one in which a net decrease in computer PNA emissions occurs from 1972 through 1976. Both schedules would provide for a lead-free gasoline by 1975.

30653 **APTIC NO. 53474**

Barrett, George M.

LOW POLLUTION HEAT ENGINE. *(Assignee not given.) U. S. Pat. 3,698,184. 5p., Oct. 17, 1972. 6 refs. (Appl. Nov. 4, 1970, 9 claims).*

A rotary heat engine which operates generally on the basis of the Carnot cycle and includes a rotor mounted within a chamber and sealed relative to the chamber by means of a plurality of radiating vanes is described. Gas, compressed in the mechanical compression cycle of the engine, is by passed to the part of the invention wherein isothermal expansion normally occurs in the Carnot cycle. The compressed gases are heated to supply greater energy to produce a greater energy working in both the isothermal expansion phase and the reversible adiabatic expansion phase and the reversible adiabatic expansion phase of the cycle. In addition, external flow passages are connected to the chamber of the engine in the area where isothermal compression occurs for accelerating the isothermal compression. It is proposed to use substantially pollution-free hydrocarbon as the fuel for the heater, and the same hydrocarbon may be utilized as the gas sealed within the engine. (Author abstract)

30654 **APTIC NO. 53044**

Basu, A. K., R. S. Dhaneshwar, and C. S. G. Rao

SOME ASPECTS OF ENVIRONMENTAL POLLUTION IN AND AROUND CALCUTTA CITY. *Sci. Cult., 38(11):471-475, Nov. 1972. 6 refs.*

Water and air pollution, sewage, and refuse in Calcutta are reviewed. Rapid industrialization and urbanization have caused increased air pollution in the city. Automobiles, coal-burning, and industries are the main sources of pollution. Calcutta is the most polluted Indian city and has lower wind speeds and frequent inversions which heighten the pollution effects. Refuse is disposed of in dumps, in sanitary landfills, by composting, and by incineration.

30655 **APTIC NO. 53197**

Betts, Anson G.

RECOVERY OF SULPHUR DIOXIDE (SO2) FROM GAS STREAMS AND PRECIPITATION OF ALUMINUM FLUORINE PRODUCT. *(Assignee not given.) U. S. Pat. 3,697, 248. 4p., Oct. 10, 1972. 14 refs. (Appl. Dec. 31, 1970, 7 claims).*

In this invention a fluoriferous calcium phosphate mineral of the group which includes phosphate rock, apatite, aluminous phosphate, and a concentrate of any of them, suitably in a finely-particled condition, is used in an aqueous suspension to combine with sulfur dioxide of a gas stream resulting from combustion of a sulfur-containing substance such as coal or other fuels. The mixture is then reacted with aluminum compounds to precipitate an aluminum fluorine product from the fertilizer product. The phosphate rock previously had not been successfully reacted with sulfurous acid. In the new method, the rock can be decomposed and converted to a product mainly consisting of artificial solid hydrated calcium sulfite and calcium phosphate if it is used with a reactable aluminum compound. (Author abstract modified)

30656 **APTIC NO. 53542**

Bright, Cooper, Toivo Lamminen, Kenneth Hanko, James Mullaly, Michael Tomaszewicz, Richard Heller, and Robert Helfand

COMPARISON OF MOBILE SOURCE EMISSIONS FROM AIRCRAFT, AUTOMOBILES, BUSES, RAILROADS, AND ELECTRIC TRAINS. (PROJECT EAGLE). (FINAL REPORT). *Rutgers Univ., New Brunswick, N. J., Center for Transportation Studies, Dept. of Transportation Federal Aviation Administration Contract DOT-FA72WA-2877, Rept. FAA-EQ-73-2, Work Unit 38341, 449p., Dec. 1972. 138 refs.*

A study comparing mobile source emissions from aircraft, automobiles, buses, trucks, railroads, and electric trains within the continental United States during the period 1940-1980 is presented. This includes air pollution created by operations of air carriers and military and general aviation aircraft. The pollutants considered for all these modes of transportation were carbon monoxide, hydrocarbons, and nitrogen oxides and, in addition, for electric trains, pollutant values for sulfur oxides and particulates. For the period 1940-1980 public carriers including air transportation showed significantly less air pollution than autos both in grams per passenger mile and total tons. For the same period, aircraft showed less air pollution than buses and railroads both in grams per passenger mile and total tons. The comparison of mobile source emissions pollution from aircraft, autos, buses, trucks, railroads, and electric trains provided information required by planning agencies and legislative bodies in providing support for mass transit projects to assist in reducing air pollution and conserving petroleum resources. Developing aircraft suitable for operating intraurban mass air transportation in competion with automobiles would make possible a drastic reduction in air pollution.

30657 **APTIC NO. 53369**

Broadhurst, Martin G.

USE AND REPLACEABILITY OF POLYCHLORINATED BIPHENYLS. *Environ. Health Perspect., no. 2:81-102, Oct. 1972. 129 refs. (Presented at the PCB Conference, 1971.)*

The use replaceability of polychlorinated biphenyls (PCB) as a dielectric, industrial, and heat transfer fluids and plasticizers are discussed. The major value of the PCB liquids is that those with four or more substituted chlorines per molecule are nonflammable as are their decomposition products. They can be used as fluids at temperatures up to 700 F without danger of explosions and fires. The major disadvantage of the PCB s is their possible toxicity. The PCB s are used in fluids for electrically insulating and cooling transformers when the transformers are used in or near buildings. Replacement of PCB s in capacitors and transformers would be expensive in terms of time and money. The PCB s are useful in hydraulic systems where leakage onto hot metal surfaces could cause fire. Hydraulic fluids can also be made with phosphate esters which are toxic and which will burn at high temperatures. Replacement of PCB s in some hydraulic systems could increase loss of life due to fire. The PCB fluids are useful in diffusion booster pumps to produce moderately high vacuums with relatively poor fore vacuums. Nonflammability is not especially important for diffusion pump liquids, and alternative liquids are available. Flammable heat transfer fluids present a fire hazard if they leak into a furnace or onto hot surfaces. The use of PCB s can prevent this danger. Replacement of PCB s is satisfactory in some, but may be dangerous in other heat transfer uses. The PCB s are effective plasticizers for use with adhesives, textiles, surface coatings, sealants and copy paper. In some cases the PCB s act as fire retardants. Phosphate esters are equally effective plasticizers and fire retardants. (Author abstract modified)

30658 **APTIC NO. 53041**

Chatterjee, Sujit Mohan and Swades Kumar Bhattacharya

THE ROLE OF ECOLOGY IN NATIONAL DEVELOPMENT. *Sci. Cult., 38(11):475-480, Nov. 1972. 11 refs.*

Natural resources consist of renewable and nonrenewable types. Because of overpopulation in India, the correct use of resources is a serious problem. Food production, use of forest and agricultural land, exploitation of resources, pollution of rivers and other water resources, and power generation in India are discussed. Air pollution consists of particulate matter, irritants, oxidants, and poisons which can affect property, vegetation, human and animal health, surface soiling, and sky darkening. Land utilization and mineral production in India are also reviewed.

30659 **APTIC NO. 52991**

Dietzmann, Harry E., Karl J. Springer, and Ralph C. Stahman

DIESEL EMISSIONS AS PREDICTORS OF OBSERVED DIESEL ODOR. *Preprint, Society of Automotive Engineers, Inc., New York, 18p., 1972. 18 refs. (Presented at the Society of Automotive Engineers, National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., Sept. 11-14, 1972, Paper 720757.)*

Linear correlations were developed for 31 trucks and buses powered by 20 different diesel engines between the concentrations of 11 different pollutants in the exhaust and the intensities of the four types of diesel odor (composite, aldehydic, oily, and pungent) as measured by a panel of trained evaluators, the correlation coefficients being determined by linear regression analysis. Odors were analyzed by non-dispersive infrared spectrometry, gas chromatography, gas-liquid chromatography, and flame ionization detection. The main contributors to the composite odor were acrolein and other aldehydes, total hydrocarbons carbon monoxide, and ethylene; acetylene and carbon dioxide showed strong negative correlations. A correlation equation based on seven vehicles was somewhat more accurate than one based on all 21.

30660 **APTIC NO. 52956**

Dix, Donald M. and E. Karl Bastress

APPROACHES TO DESIGN OF LOW-EMISSION GAS-TURBINE COMBUSTION CHAMBERS. *Preprint, Society of Automotive Engineers, Inc., New York, 20p., 1972. 21 refs. (Presented at the Society of Automotive Engineers, National Combined Farm, Construction and Industrial Machinery and Powerplant Meeting, Milwaukee, Wis., Sept. 11-14, 1972, Paper 720728.)*

The elements and results of a technical approach to the design of low-emission gas-turbine combustors are described. The role of emissions modeling, the major features of an emissions model, the integration of conventional combustor design methodology with an emissions model, and the application of the combined methodology to specific design approaches are examined. The results indicate that emissions models that include nonuniformity of local gas conditions are of immediate utility in the design process, but that further effort in relating this nonuniformity to both conventional design parameters and conventional performance parameters is required. Applications to specific design approaches indicate that very limited emission reduction is obtainable by purely aerodynamic means and that improved fuel injection offers more potential for emission reduction, but that the most stringent emission standards will require either variable-air-distribution or variable-fuel-distribution combustors. (Author abstract)

30661 **APTIC NO. 52959**

Ebersole, G. D. and F. S. Manning

ENGINE PERFORMANCE AND EXHAUST EMISSIONS: METHANOL VERSUS ISOOCTANE. *Preprint, Society of Automotive Engineers, Inc., New York, 20p., 1972. 21 refs. (Presented at the Society of Automotive Engineers, National West Coast Meeting, San Francisco, Calif., Aug. 21-24, 1972, Paper 720692.)*

Operating characteristics of a single-cylinder, spark-ignition engine fueled by both methanol and isooctane were determined. Engine output, indicated specific fuel consumption, and specific emissions of hydrocarbons, carbon monoxide, nitric oxide, and aldehydes were measured for both fuels and compared using performance maps. The engine output comparisons showed that lean misfire limits occurred at leaner mixtures with methanol than with isooctane and that maximum engine output levels were nearly equal for both fuels. Comparison of the specific parameters of each fuel at equivalent power levels obtained with maximum power spark timing lead to the following conclusions: use of methanol resulted in higher indicated specific fuel consumption, greater emission of aldehydes, but lower emissions of hydrocarbons and nitric oxide; the two fuels showed similar trends of carbon monoxide emissions. (Author abstract)

30662 **APTIC NO. 52654**

Halderson, James Lee

DYNAMIC RESPONSES OF AN ANAEROBIC DIGESTER WITH DAIRY COW MANURE SUBSTRATE. *Purdue Univ., Lafayette, Ind., Dept. of Agriculture, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms Inc., 1972, 128p. 46 refs.*

The dynamic response of anaerobic digestion when that system was subjected to several levels of step rate changes in loading was investigated. Laboratory sized, 4-liter digesters, constructed of acrylic, maintained at 35 C, and continuously mixed were used to investigate that response when dairy cow fecal matter was the substrate. The units were batch fed once/day, with a 15-day detention time being maintained throughout the experiment. Dependent parameters measured were pH, total and volatile solids, total alkalinity, chemical oxygen demand (COD), gas production and composition, and total volatile acid concentration and composition. The experimental design consisted of a randomized block design with four factors and five levels of treatment. The fixed loading levels were considered to be the treatment with all other factors being held constant when possible. The average system pH was about 6.85 (plus or minus 0.1) with a range of 6.7-7.0. Higher loading rates slightly increased pH. Alkalinity averaged about 2850 mg/l as calcium carbonate and varied little throughout the range of loading. Volatile solids reduction of 55% was greatest at the highest achieved loading level of 150 g of wet manure/day. COD reductions of 35% were found also at the highest loading level. Gas production averaged about 60% methane. Composition analysis did not indicate digestion impairment at any loading level. Volatile acid concentration reduced 1220 mg/l as calcium carbide and did not appear to retard digestion. Analysis for acid composition was not responsive enough to be a useful indicator of biodegradation. A detention time of 15 days appeared sufficient for allowing the microbial population time to stabilize after a step change in loading rate. (Author abstract modified)

30663 **APTIC NO. 52580**

Harkness, N., A. R. Oliver, A. J. Gough, R. Tabberer, and D. Keight

SOME OBSERVATIONS ON THE INCINERATION OF SEWAGE SLUDGE. *Water Pollut. Contr., 71(1):16-33, Jan. 1972. 10 refs.*

An extensive analysis of incineration as a method of sludge disposal was carried out. The composition of several secondary digested sludges, and the drying and combustion characteristics of various sludge solids, are described. In an experiment with both powdered sludge and small pieces of sludge cakes, combustion of the cake was slightly more rapid. In dewatering sludge before incineration, an attempt is generally made to produce a cake in which combustion will be selfsupporting; the amount of dewatering necessary depends on the caloric value of the sludge, the efficiency of the heating, and the amount of heat recovery achieved. Some methods of sludge dewatering include: sludge pressing with lime and ferrous sulfate or with aluminum chlorohydrate; vacuum filtration with lime and ferrous sulfate, aluminum chlorohydrate, or polyelectrolytes; and filter belt pressing with polyelectrolytes. Sludge conditioned with incinerator ash has about the same moisture content as sludge conditioned with chemicals, but a much lower caloric value. With a rotary kiln furnace, dewatering for cake formation is not necessary, since wet sludge can be successfully dried and incinerated. Exhaust gases from sewage sludge incineration are likely to contain evaporated water, combustion products, nitrogen from combustion air, excess air, sulfur dioxide, nitrogen oxides, hydrochloric acid, and other volatile compounds present in trace amounts in the sludge. Dust and grit can be removed by wet scrubbers, cyclones, or electrostatic precipitators. Malodorous compounds may be emitted if combustion is not complete. Activated sludge appears to be more suitable for wet-air oxidation treatment than primary sludges. In pyrolysis of sludge-heating powdered dried sludge in the absence of air--the nature of the products is dependent upon the temperature used.

30664 **APTIC NO. 53129**

Hockel, M. L.

THE EFFECT OF THE MODE OF COMBUSTION IN FAST DIESEL ENGINES ON SILENT RUN AND ON THE POSSIBILITY TO USE DIFFERENT KINDS OF FUEL. *(Influenza del procedimento di combustione nei motori Diesel veloci sulla silenziosita e sulla possibilita di utilizzare combustibili diversi). Text in Italian. Lo Smog (Italy), 1972:19-25, 1972.*

A comparative study was made of the effect of the mode of combustion on fast diesel engine performance used three diesel engines, one with turbulene combustion, the second with direct injection, and the third with a combustion antechamber. Single cylinder engines were used with 2200 rev/min. Fuel combustion was highest in the first engine. In the third method, fuel injected into the antechamber burned spontaneously causing an increase in pressure; thus, the major part of the still intack fuel reached the principal combustion chamber through relatively narrow orifices where, mixed with air it burned completely. Combustion was silent, pressure increase velocity was relatively low, so this engine was less sensitive to fuel quality. Combustion was easily controlled. The disadvantage was somewhat higher fuel consumption than with the direct injection method. The engine functioned well with kerosene JP4 used in turbines and with gasoline of above 90 octanes neither could be used in the other two engines. The engine started well in cold weather without any auxiliary devices, which is extremely important in a dieesel. This held for temperatures down to -15 C; with preheating spark-plugs, the engine started at -25 C. The combustion system is known as the MWM equal pressure system with a combustion antechamber.

30665 **APTIC NO. 53401**

Kennedy, Maurice V., Boris J. Stojanovic, and Fred L. Shuman, Jr.

ANALYSIS OF DECOMPOSITION PRODUCTS OF PESTICIDES. *J. Agr. Food Chem., 20(2):341-343, March/April 1972. 6 refs.*

Analyses were performed to identify the products formed upon the chemical or thermal decomposition of the following pesticides: Atrazine, Bromacil, Carbaryl, Dalapon, DDT, Dicamba, Diedrin, Diuron, DNBP, DSMA, Malathion, Nemagon, Paraquat, Picloram, PMA, Trifluralin, 2,4-D, 2,4,5-T, Vernam, and Zineb. The gaseous products resulting from heat treatment were analyzed by gas chromatography, infrared spectrometry, adsorption onto solids, or absorption into liquids. The wide variety of products made it necessary to employ electron capture, hydrogen flame ionization, and thermal conductivity detectors for the gas chromatographic analyses. The thermal decomposition products occurring were carbon dioxide, carbon monoxide, nitrogen oxides, hydrochloric acid, and residues of inorganic compounds. Analyses performed to determine the decomposition products when the pesticides were exposed to chemicals gave a variety of compounds, depending on the chemical used. The decomposition products, if any, are identified for certain of the pesticides after exposure to the potential decontaminants. These products include compounds formed by oxidation, reduction, molecular structure rearrangement, and decomposition. (Author abstract modified)

30666 **APTIC NO. 53352**

Lang, Jerry M.

ANTI-POLLUTION SOLID WASTE BURNING INCINERATOR. *(Care, Inc., Lindale, Tex.) U. S. Pat. 3,707,128. 7p., Dec. 26, 1972. 6 refs. (Appl. March 31, 1971, 5 claims).*

An antipollution incinerator which is effective in controlling the amount of by-products of combustion introduced into the atmosphere is described. The incinerator has a pressurized combustion chamber which effects maximum combustion of the material with a minimum of pollutants exhausted. The incinerator includes a pressurized flame directed across a flue entrance opening whereby the flame produces a restrictive air block of the flue opening, thereby increasing pressure within the combustion chamber. The pressurization of the combustion chamber which improves the combustion efficiency and reduces the amount of by-products of combustion exhausted into the atmosphere is the main advantage of this incinerator over other incinerators. (Author abstract modified)

30667 **APTIC NO. 53441**

Leclercq, R., D. W. Bixby, and H. L. Fike

POTENTIAL USES FOR SULPHUR DIOXIDE. *Sulfur Inst., Washington, D. C., Tech. Bull. 19, 23p., Jan. 1972. 126 refs.*

Some of the less well known, presently uncommercialized, and recently developed uses of sulfur dioxide are reviewed. It can be used as: a source of plant nutrient sulfur; a catalyst in fatty oil technology; a working fluid in thermal power plants; a pulping agent; a solvent for sulfur trioxide in sulfonation reactions; and a reaction medium. It can also be used in the following industrial processes: sewage treatment; sugar manufacture; the reclamation of tile drains; copolymerization; the processing of copper and titanium ores; the catalytic oxidation of hydrocarbons; bleaching and the prevention of microbial decomposition of wood chips; synthetic fiber production; water purification; the separation of calcium and magnesium; phosphoric acid recovery; glass manufacture; rubber treatment; and sodium hydrosulfite. Finally, it can be used to increase the water penetration of the soil and in batteries and fuel cells. These potential uses are described and evaluated in the light of technological advances and economic changes.

30668 **APTIC NO. 52958**

Newkirk, Marc S. and James L. Abel

THE BOSTON REFORMED FUEL CAR. *Preprint, Society of Automotive Engineers, Inc., New York, 8p., 1972. 13 refs. (Presented at the Society of Automotive Engineers, New England Section Meeting, Nov. 2, 1971, Paper 720670.)*

The Boston reformed fuel car is described. It uses a standard Ford V-8 engine with a special carburetor designed to permit operation on a mixture of hydrogen and carbon dioxide produced by steam reforming of gasoline. Gasoline and steam superheated to 1000 C are injected serially into the reformer. Carbon from gasoline decomposition is held on a trap of alumina beads and converted to carbon monoxide by the steam. Downstream a second injection of low temperature steam (less than 427 C) promotes the shift of carbon monoxide to carbon dioxide and hydrogen. Water for the reformer is supplied by condensation from the exhaust gas. The reformer burner operates on hydrogen, and a small tank of reformed gas is included for starting the system. Maintenance requirements are extremely low; engine oil breakdown after several hundred hours of operation was negligible. Based on published data, nitrogen oxide emissions are expected to be about 0.2 g/mi.

30669 **APTIC NO. 52761**

Nitsche, Manfred

CRITICAL THOUGHTS ON THE PLANNING OF AN INDUSTRIAL INCINERATOR. *(Kritische Gedanken bei der Planung einer industriellen Abfallverbrennungsanlage). Text in German. Preprint, Johann Halterman Werk, Hamburg (West Germany), 11p., 1972. (Presented at the VTG-DECHEMA, Kniebis, West Germany, Nov. 21, 1972.)*

For the planning of an industrial incinerator it is important to know the composition of the waste material which is to be burned, and its quantity which is difficult to burn considering the variety of industrial waste products. For liquid waste material the muffel furnace with overpressure firing; for solid and pasty matter, the rotary kiln seems to be the best solution. Flue gas cooling is simplest with evaporation cooling. For cleaning of the incinerator waste gases so many different methods are available so that hardly any recommendations can be made without knowledge of the exact composition of the gases. A combination of mechanical separation with a succeeding cross flow scrubber, however, seems to be most flexible. A cost calculation for an incinerator with an hourly capacity of 3 tons of waste and a heat production of 19.5 million kcal/hr is attached to the paper. The various waste gas cleaning methods are discussed with respect to collection efficiency and power demand. Venturi scrubbers have a high power consumption and a comparably low efficiency. For filters, electrostatic precipitators, and condensation separators, no generally valid relation between collection efficiency and energy demand exists. There is likewise no connection between the absorption rate and the energy demand. This can be clearly seen from two drawings attached to the paper.

30670 **APTIC NO. 53436**

Orrin, D. S., W. R. Miner, and K. L. Kipp

UNLEADED GASOLINE - LUBRICANT REQUIREMENTS AND FUEL ADDITIVE PERFORMANCE. *Preprint, Society of Automotive Engineers, Inc., New York, 13p., 1972. 20 refs. (Presented at the Society of Automotive Engineers, National West Coast Meeting, San Francisco, Calif., Aug. 21-24, 1972, Paper 720689.)*

Unleaded gasoline was used in a 30 car, 48,000 mile taxicab field test to study the effects of a deposit control (DC) gasoline additive and lubricating oil additives on engine deposits, wear, and other variables. The unleaded gasoline performed as well as or better than a leaded gasoline in this test when both gasolines contained the DC additive. Engine deposits were comparable, and wear and corrosion were reduced when unleaded gasoline was used. With unleaded gasoline, motor oils needed a high level of ashless dispersant to obtain maximum varnish control. Also, in these test engines, an ashless oil gave the same wear protection with unleaded gasoline that an SE-type oil gave with leaded gasoline. A highly effective DC gasoline additive minimized carburetor, intake valve, and crankcase deposits with unleaded gasoline. This agreed with the effective performance that this additive had previously shown in leaded gasoline service. Also, unleaded fuel with the DC additive used with a nondispersant crankcase oil performed similarly to a nonadditive unleaded fuel used with an SE-type oil in the control of engine sludge and varnish. (Author abstract)

30671 **APTIC NO. 53391**

Papageorgiou, John C.

FUTURE SIZE OF CITIES AND QUALITY OF LIFE. *Preprint, Inst. of Management Sciences, Pleasantville, N. Y., 9p., 1972. 5 refs. (Presented at the Institute of Management Sciences, International Meeting, 19th, Houston, Tex., April 4-8, 1972.)*

A summary of a previous attempt to forecast the size of cities in the United States in the future and an examination of the relationship between the size of metropolitan areas and several factors selected from the crime and pollution categories are presented. The pollution factors considered were the arithmetic average of suspended particulate matter in micrograms/cu m (1969) and arithmetic average of benzene-soluble organic matter in micrograms/cu m (1969). The results indicated that none of the factors considered in the study seem to be affected significantly by the size of the metroplitan population. Consequently, if the data are representative of the actual situation, the allegation that in large metropolitan areas there is more crime and pollution, for example, than in smaller ones does not seem to be valid.

30672 **APTIC NO. 52571**

Santti, Reino

ENVIRONMENTAL PROBLEMS INVOLVED IN SEWAGE SLUDGE TREATMENT. *(Miljovardsfragor vid slambehandling). Text in Swedish. Nordforsk Miljovardssekretariatet, Attonde Nordiska Symposiet om Vattenforskning, Skokloster, 1972, p. 15-27. 5 refs. (April 25-27.)*

Air, water, and soil pollution hazards associated with sewage sludge treatment processes are outlined. Sludge treatment processes are susceptible to generate gaseous and particulate emissions, the former particularly being caused by anaerobic and aerobic sludge stabilization. Particulate emissions may contain organic and inorganic sludge particles, bacteria, and viruses. The magnitude of the emissions is strongly dependent on the specific type and the degree of tightness of sludge treatment processes and equipment. Malodorous emissions are generated by the drying of anaerobically stabilized sludge in drying beds and by thermal conditioning. The malodorous pollutants involved are methane and hydrogen sulfide. Aerobic stabilization causes fewer odorous emissions, notwithstanding emissions which contain pathogenic germs. Sludge incineration causes most of the air pollution problems relative to sludge treatment. To abate such emissions, high combustion temperature, and effective fly ash separation are necessary.

30673 **APTIC NO. 52530**

Schuster, Ray

TURNING TURBINES WITH GEOTHERMAL STEAM. *Power Eng., 76(3):37-41, March 1972.*

Although the generating capacity available from geothermal steam represents only a fraction of national energy requirements, a great deal of public attention has been directed toward the technique as an environmentally acceptable energy source. Geysers development is discussed. Geothermal energy in Iceland is discussed in detail. The geothermal steam does not have to be condensed separately and returned to a boiler, and therefore the less expensive direct-contact condenser can be used. Load-limiting, and electrical features of geothermal energy plants are discussed. The possibility of expanding U. S. geothermal capacity through the use of nuclear explosives to fracture large quantities of underground hot rock has been reviewed.

30674 **APTIC NO. 53402**

Shultz, J. L., R. A. Friedel, and A. G. Sharkey, Jr.

HIGH-RESOLUTION MASS SPECTROMETRIC INVESTIGATION OF HETEROATOM SPECIES IN COAL-CARBONIZATION PRODUCTS. *Fuel, 51(3):242-246, July 1972. 11 refs.*

An investigation of the high-resolution mass spectra of coal-tar pitch and the concentrate of the pitch containing the heteroatom species demonstrates the power of this technique to detect species containing heteroatoms in complex aromatic matrices and supports the presumption of similarity between organic contaminants in airborne particulate material and coal-tar pitch. Qualitative analysis of an 80 to 85 C softening point pitch yielded molecular formulae for 239 compounds which correspond to a minimum of 108 structural types and their alkyl derivatives. Structures containing C-H, C-H-O, C-H-N were the most numerous, while species containing sulfur, nitrogen, ON substituent, oxygen, and O2N2 substituent were also present. The data support the conclusion that the majority of the unidentified constituents of coal-tar pitches consist of higher molecular weight homologues of the known components. Throughout all classes of hydrocarbons detected, the same skeletal ring structures were indicated; the series of components with molecular weights differing by 50 mass units indicated the linear (or angular) addition of an aromatic ring to the lower molecular weight nuclei, while the series differing by 24 mass units was interpreted as ring closure with the addition of two carbons to form a more highly condensed ring system. (Author abstract modified)

1971

30675 **APTIC NO. 52558**

National Aeronautics and Space Administration, Edwards, Calif., Flight Research Center

ENVIRONMENTAL IMPACT STATEMENT. (FINAL). *11p. Aug. 18, 1971.*

NTIS: PB 202054-F

The NASA Flight Research Center, located in the Mojave Desert approximately 100 miles northeast of Los Angeles, conducts aeronautical and space-related research using a wide variety of aircraft and aerospace vehicles. Operations at the Center have a very negligible impact on the environment; they are planned and controlled to eliminate or minimize effects on water, air, and noise. All Center boiler plants and standby electric power facilities are fired with natural gas. Sewage disposal is accomplished through a modern system of underground sewage lines, lift stations, and sewage ejection pits to a sewage treatment plant. Any spillage or run-off from shops and hangars is transferred through an underground waste drain system to a spill pond. Garbage is disposed of in a landfill facility. Flights are conducted at altitudes and over geographic areas that avoid populated communities. Completion of a Noise Suppression and Remote Test Facility will resolve the local ground noise problem.

30676 **APTIC NO. 52584**

Dept. of the Navy

FINAL ENVIRONMENTAL IMPACT STATEMENT: NAVY F-14 FIGHTER AIRCRAFT. *43p., Sept. 1971.*

NTIS: PB 199851F

An environmental impact statement was prepared for the F-14 aircraft to define the possible adverse effects of the aircraft on air quality. The specific pollutants generated by the engine exhaust would include carbon monoxide and hexane and minimal amounts of nitrogen oxides, hydrocarbons, and smoke. Sound control, water quality, and effects on fish and wildlife were also studied.

30677 **APTIC NO. 52586**

Defense Documentation Center, Alexandria, Va.

ENVIRONMENTAL POLLUTION: AIR POLLUTION -- EXHAUST GASES. VOLUME I. *Rept. DDC-TAS-71-41-I, 89p., AUg. 1971. 50 refs.*

NTIS, DDC: AD 730310

A bibliography of 50 references and abstracts on air pollution from exhaust gases is presented. The various reports include studies on gas turbine power plants; combustion and flame chemistry; smoke stacks; fuel atomization; automotive pollution controls; rocket exhausts; pollution by ozone, lead, metal compounds, nitrogen oxides, carbon monoxide, hydrocarbons, and aerosols; engine exhausts; fossil fuel combustion kinetics; pollution measurement methods; meteorological variables in relation to atmospheric transport and diffusion of pollutants; fuels and fuel additives; and pollution generated by aircraft, submarines, ships, and rockets.

30678 **APTIC NO. 53115**

National Swedish Environment Protection Board

AIR POLLUTION PROBLEMS AT STATIONARY SOURCES IN SWEDEN. *240p., Dec. 1971. 50 refs.*

Recommendations for measures to restrict the emission from plants causing air pollution are presented. A survey of the art was done for a variety of industries and the amount of emissions from each plant were studied, including: the iron and steel industry, sintering plants, the ferro-alloy industry, the foundry industry,the cement industry, hot-mix asphalt paving plants, the wood pulp industry, the inorganic chemical industry, oil-heated power plants, lime works, petroleum refineries, sulfuric acid plants, ammonia plants, chloralkali plants, steam power stations having a power input exceeding 300 MW, gas turbine plants, and incineration plants for refuse disposal. Various technical methods to reduce emissions at these plants are reviewed. The recommendations are intended for both existing installations and new installations. The choice of chimney height, discharge of sulfur dioxide and particulate matter, inspection and maintenance of the plants and operational control are discussed. The costs of developing various technical control methods are reviewed.

30679 **APTIC NO. 53123**

Davis (W. E.) and Associates, Leawood, Kans.

NATIONAL INVENTORY OF SOURCES AND EMISSIONS: MERCURY - 1968. *Office of Air and Water Programs Contract CPA-70-128, Pub-APTD- 1510, 69p., Sept. 1971. 38 refs.*

NTIS: PB 220621

An inventory of atmospheric emissions has been prepared to determine the nature, magnitude, and extent of the emissions of mercury in the United States for the year 1968. The flow of mercury has been traced and charted, indicating that the consumption was 2866 tons while domestic production of primary and secondary mercury was 2403 tons. Imports, principally from Spain, Canada, and Mexico totaled 883 tons. Emissions to the atmosphere during the year were 840 tons. About 30% of the emissions resulted from the combustion of coal. Other significant emissions were due to the use of paint, the processing of mercury, and the use of mercury in the electrolytic preparation of chlorine and caustic soda. Emission estimates were based on observations made by personal contact and on information provided by mining, processing and reprocessing companies. (Author abstract)

30680 **APTIC NO. 53124**

Davis (W. E.) and Associates, Leawood, Kans.

NATIONAL INVENTORY OF SOURCES AND EMISSIONS: MANGANESE - 1968. *Office of Air Water Programs Contract CPA-70-128, Pub-APTD-1509, 68p., Aug. 1971. 26 refs.*

NTIS: PB 220620

The inventory of atmospheric emissions has been prepared to determine the nature, magnitude, and extent of the emissions of manganese in the United States for the year 1968. The flow of manganese in the U. S. for that year has been traced and charted. The consumption was 1,150,000 tons while domestic production was only 48,000 tons. Imports principally from Brazil, Gabon, Republic of South Africa, Congo, Guyana, India, Angola, and Australia totaled 1,053,000 tons. Emissions to the atmosphere during the year were 18,992 tons. About 47% of the emissions resulted from the production of ferroalloys and about 37% from the production of iron and steel. The combustion of coal was also a significant source of manganese emissions. (Author abstract)

30681 **APTIC NO. 53149**

Davis (W. E.) and Associates, Leawood, Kans.

NATIONAL INVENTORY OF SOURCES AND EMISSIONS: BERYLLIUM - 1968. *Office of Air and Water Programs Contract CPA-70-128, Pub- APTD-1508, 53p., Sept. 1971. 18 refs.*

NTIS: PB 220975

The production and use of beryllium in the United States has been traced and charted for the year 1968. The consumption was 351 short tons, while production from domestic mines was only 7 short tons. Approximately 98% of the beryllium processed was from imported beryl ore. Beryllium metal production accounted for the use of 125 tons (35%), beryllium alloys for 175 tons (50%), ceramics for 16 tons (5%), with the remaining 10% lost during processing. Emissions to the atmosphere during 1968 totaled 164 tons. Emissions resulting from the combustion of coal and fuel oil were 147 and 8 tons, respectively; those from the production of cast iron amounted to 4 tons. The emission estimates for coal combustion are based on the average beryllium content of many coal samples and are considered to be reasonably accurate. (Author summary modified)

30682 **APTIC NO. 53150**

Davis (W. E.) and Associates, Leawood, Kans.

NATIONAL INVENTORY OF SOURCES AND EMISSIONS: ARSENIC - 1968. *Office of Air and Water Programs, Contract CPA-70-128, Pub- APTD-1507, 58p., May 1971. 27 refs.*

NTIS: PB 220619

An inventory of atmospheric emissions has been prepared to provide reliable information regarding the nature, magnitude, and extent of the emissions of arsenic in the United States for the year 1968. A total consumption of 28,000 tons was used as follows: 72% by imports (20,000 tons) and 28% by domestic producers (8000 tons). Emissions from metallurgical processing plants of the primary producers of copper, lead, and zinc were 4466 tons, and those due to the use of pesticides were 3270 tons. These two emission sources combined accounted for 82% of the 9415 tons of total emissions in 1968. Arsenic emissions to the atmosphere could be reduced by a decrease in imports coupled with an increase in domestic production. Sufficient economic incentive might induce a number of nonferrous smelters who currently process ores that contain significant quantities of arsenic into recovering the element rather than treating it as an unwanted by-product. The emission estimates for processing and reprocessing operations are based on estimates obtained through personal contact with the processing and reprocessing companies and on engineering calculations supported by data covering smelter gas flow rates and temperatures. (Author summary modified)

30683 **APTIC NO. 53526**

National Industrial Pollution Control Council, Washington, D. C.

AIR POLLUTION BY SULFUR OXIDES. *24p., Feb. 1971. 16 refs.*

GPO

About one-third of the sulfur entering the atmosphere is manmade and is mostly in the form of sulfur dioxide; the rest is from natural sources such as volcanoes and fumaroles. In 1968, the United States released 33 million tons of SO2 into the atmosphere. Approximately 80% of man-made SO2 pollution results from the burning of fossil fuels containing sulfur compounds; approximately 46% results from burning fossil fuels in electric power plant operations. The requirement for electric power is expected to increase at an annual rate of 6% over the next 30 years, and no decrease in the current levels of SO2 air pollution from electric power production is expected before the year 2000. Sulfur dioxide in the atmosphere at high enough concentrations (in some cases, 0.5 ppm) can be harmful to vegetation and to animal species, including man; it is also subject to oxidation and to absorption into water droplets, resulting in the formation of sulfuric acid mist. Paints, metals, building materials, and textile fibers are among the materials which can be degraded by airborne sulfuric acid mist. Among the methods which can be used to reduce sulfur oxide pollution are: the use of low sulfur fuels; the substitution of other energy sources; the removal of sulfur from fuel prior to burning; the removal of sulfur oxides from flue gases; and the dispersal of pollutants. The Federal government and industry are cooperating to eliminate high levels of sulfur oxide emissions from industrial operations. Research is continuing to determine better and more economical methods of sulfur oxide air pollution abatement. (Author summary modified)

30684 **APTIC NO. 53412**

Bagg, J.

THE FORMATION AND CONTROL OF OXIDES OF NITROGEN IN AIR POLLUTION. *In: Air Pollution Control Part 1. W. Strauss, (ed.), New York, Wiley-Interscience, 1971, p. 35-94. 195 refs.*

The formation and control of oxides of nitrogen are reviewed with emphasis on the need for more information concerning the chemical s effects on humans, the degree of control necessary, and effective methods of control. The choice of the method or methods of control will depend upon several factors which include the particular source of emission, the cost, and the desired degree of control. The degree of control of oxides of nitrogen necessary to eliminate photochemical smog is still a matter of some controversy. Photochemical reactions are discussed. Moreover, additional information concerning the chemical s effects on all forms of life, particularly human, is necessary in order to establish acceptable levels. The level suggested by Larsen of 0.1 ppm (averaged over 1 hr) seems to be a good choice in the absence of more desirable information. The achievement of this level will require a total emission reduction of 90% in many cities. Catalytic reduction of nitrogen oxides appears, presently, to be the most effective means of achieving the desired level, both for standard and mobile sources. Satisfactory cost-control estimates are impossible at present due to the developmental stage of control technology, notwithstanding the treatment of tail-gas from nitric acid plants. Major NOx emission sources are automobiles, diesel engines, gas turbines, furnaces, incinerators, and chemical plants.

30685 **APTIC NO. 52569**

Balzer, J. LeRoy, W. Clark Cooper, and Douglas P. Fowler

FIBROUS GLASS-LINED AIR TRANSMISSION SYSTEMS: AN ASSESSMENT OF THEIR ENVIRONMENTAL EFFECTS. *Am. Ind. Hyg. Assoc. J., 32(8):512-518, Aug. 1971. 6 refs.*

Thirteen air transmission systems lined with fibrous glass were studied to determine their contributions of glass fibers to the air. There was a decrease in the concentrations of glass fibers after the air had passed through the systems, both in number of glass fibers and in the relative proportion of total fibers which were identifiable as glass. Glass fiber concentrations in the air of buildings correlated more closely with fiber concentrations in ambient air than with concentrations in air supplied form the system lined with fibrous glass. Concentrations were extremely low and do not appear to be biologically significant. (Author abstract)

30686 **APTIC NO. 52560**

Baum, Bernard and Charles H. Parker

THE TRUTH ABOUT SOLID WASTE DISPOSAL. *Soc. Plastics Engrs. J., 27(11):18-22, Nov. 1971. 11 refs.*

In the United States, plastic wastes make up about 2% of the collectable refuse; about 54% of this waste is polyolefin, 20% is polystyrene, and 11% is polyvinyl chloride. Four methods of waste management presently considered acceptable for solid wastes that include plastics are sanitary landfill, incineration, pyrolysis, and reuse and recycling. When properly comminuted, plastic wastes have no long-term adverse effects when used in sanitary landfill; compaction and baling of wastes will prolong the usefulness of the landfill site. Pyrolysis involves heating in the absence of air, which eliminates moisture and converts organic solids to acids, alcohols, and other condensable gases, producing salable by-products. Because no sorting system yet developed is capable separating plastics from other waste products, re-use and recycling is difficult. Incineration offers the most immediate solution to the waste problem. Careful control of feed material, air quantity, temperatures, retention time, construction materials, stack height, and gas cleaning facilities will keep corrosion and air pollution, the two major difficulties with incineration, under control.

30687 **APTIC NO. 52939**

Bizzarri, Alberto

AIR POLLUTION. *(L inquinamento atmosferico). Text in Italian. Quad. Ric. Sci., no. 74:89-100, 1971. 9 refs.*

Pollution sources, principal pollutants, the effects of atmospheric pollution, and the pollution situation prevailing in Italy are reviewed. Air pollution episodes are known in Italy with the focal point being Milan. Pollution of strictly industrial origin is prevalent only in industrial agglomerations located in comparatively small communities like Marghera and Mori in the Trentino where an aluminum plant was closed down for some time because of complaints by the inhabitants. In large urban centers it is the combined effect of vehicular emissions with those from domestic heating which constitutes the problem. There is no great difference between particulate emission levels in various Italian cities, the winter levels are four times those of the summer levels. Sulfur dioxide pollution levels in Milan are higher than those of London and Paris. Vehicular pollution in Italy is not yet as bad as that in the U.S.A. Industrial pollution forms the bulk of the background pollution which can, as a result of thermal inversions which occur quite frequently in winter, lead to disastrous situations. The law governing pollution in Italy promulgated in 1966 is clearly inadequate, which combined with the nonavailability of personnel to enforce the law, are at the root of the current air pollution situation in Italy.

30688 **APTIC NO. 53434**

Bowling, K. McG.

FLUIDIZED-BED COAL PROCESSING. *Coal Res. CSIRO, no. 45:39-46, 1971. 13 refs.*

Applied studies have indicated that the fluidized bed technique can be applied to the production from coal of adequate quantities of char for blending with high volatile coal to improve its coke making properties. Other studies indicated that, at temperatures between 460 and 600 C, the coal composition and rank strongly affect the char and tar yields, the residual volatile matter in the coal, and the density and hardness of the char. Char produced in the presence of air contains more residual volatile matter than char produced in recycle gas, and increases in temperature increase the yields of liquid organic products. The temperature in the reactor also affects the hydrogen content of char produced at temperatures between 800 and 1200 C. Under conditions where air is the entraining gas and combustion in the reactor is the only source of heat, the char yield decreases linearly with increases in the air:coal ration. Under the higher temperature conditions, coals with high fixed carbon contents and just enough volatile matter to provide the necessary process heat by combustion give the highest yields of char. The rapid carbonization of certain types of coal under fluidized conditions to yield char particles of varying sizes which are potentially useful as industrial filter aids. Three potential methods of natural gas production from coal using fluidized bed techniques have also been studied: a twin vessel fluidized bed system with continuous heat transfer between the vessels by means of circulating solids; a multistage fluidized bed system; and a system using the same chemistry as the first but with molten slag as the heat transfer medium. Other studies have dealt with the mixing behavior and particle residence times in gas fluidized beds.

30689 **APTIC NO. 53006**

Maguire, B. A. and D. Barker

ASH AND QUARTZ CONTENT OF RESPIRABLE AIRBORNE DUST IN A NUMBER OF BRITISH COAL MINES. *Dept. of Trade and Industry, Sheffield (England), Safety in Mines Research Establishment, Res. Rep. 278, 16p., 1971. 12 refs.*

NTIS: T7203036

Respirable airborne dust samples, collected in a number of British coal mines, were ashed at 600 C. The quartz contents of the ashed samples were determined either by x-ray diffraction or by infrared spectrophotometry. The ash content of the dusts varied from 6.6 to 87.0% with a median of 38.0%, and quartz content varied from 0.2 to 20.9% with a median of 3.6%. In only one case was the quartz content of a dust sample greater than a quarter of its ash content. The correlation between the ash percentage and the quartz as a percentage of the respirable airborne dust was stronger than the correlation between the ash percentage and the quartz as a percentage of the ash content. If it were desirable to impose a limit on the quartz content of respirable airborne dust samples, it would be possible to propose a procedure for examining samples based initially on ash determinations followed by a reduced number of quartz determinations. (Author summary modified)

30690 **APTIC NO. 52554**

Meisel, S. L.

EXHAUST EMISSIONS AND CONTROL. *J. Wash. Acad. Sci., 61(2):91-102, June 1971. 30 refs.*

The effects of lead on exhaust emissions from current and future cars and the costs of emission controls to industry and the consumer are discussed. Removal of lead from gasoline would not affect carbon monoxide and nitrogen oxides emissions from current cars, but would decrease hydrocarbon emissions slightly and change the nature of particulate emissions. Exhaust valve recession is a potential problem with exclusive use of leadfree fuel in older cars, with resulting increases in emissions and maintenance. For future cars, both catalytic and thermal converter systems can meet very stringent emission goals with unleaded or low-lead fuel (0.5 g Pb/gal). The main effect of lead on future systems will be on maintenance and durability. Lead-free fuel may permit the use of cheaper materials and reduce maintenance costs, but the added costs, but the added costs and capital expenditures needed to produce unleaded gasolines are great.

30691 **APTIC NO. 52534**

Myers, P. S.

SPARK IGNITION ENGINE COMBUSTION AND LEAD. *J. Wash. Acad. Sci., 61(2):58-74, June 1971. 36 refs.*

Spark ignition engine combustion and the addition of lead are discussed. Lead is put in gasoline to permit the last part of the air-fuel mixture to burn to withstand higher pressures and temperatures before auto-igniting. The ability to withstand higher thermal stresses permits higher compression ratios, which in turn give better fuel economy and higher power output. The last part of the air-fuel mixture to burn experiences pressures ranging from a few hundred to 1000 psi and temperatures approaching 2000 R. Reactions take place prior to the arrival of the flame front initiated by the spark. A theoretical study of ethane under these conditions indicated a net production of radicals during the entire process. Motored engine studies showed that different fuels have different types and extents of reacting and that in a mixture of fuels there can be interaction between the different fuels. The addition of lead did not seem to affect the cool flame limits during motored operation, but did affect auto-ignition limits. Lead did not seem to affect significantly energy release rates. Lead must first decompose to lead oxide, and different kinds of lead oxides have different antiknock capabilities. The removal of lead, which will cause a decrease in gasoline antiknock quality, must be accompanied either by a reduction in engine compression ratio or a change in refining techniques to produce fuels having higher antiknock properties. The removal of 3 cu cm of lead, plus reduction in compression ratio, gives an increase in fuel consumption of as much as 10%. Lead also affects combustion chamber deposits which in turn affect knock and exhaust emissions. There is some evidence to indicate that deposits from unleaded gasoline cause a higher increase in antiknock requirement than do deposits from leaded gasoline. There is also some evidence to indicate that leaded deposits cause higher exhaust emissions. Lead normally acts as a poison for catalysts to reduce exhaust pollutants, but does not seem to affect exhaust pollutant reactions per se. (Author abstract modified)

30692 **APTIC NO. 53536**

Nales, G. J. R.

THE BOTLEK WASTE INCINERATION PLANT. *(Vuilverbrandingsinrichting Botlek). Text in Dutch. Bouw, 83(49):1818-1821, 1971.*

The planned incineration plant Botlek, near Amsterdam, designed to handle 190,000 tons of domestic waste, 440,000 tons of industrial waste, and 70,000 tons of chemical waste yearly, is described. The conventional waste incineration plant, designed for domestic and industrial wastes, will have Martin and Duerr type grates to permit incineration without auxiliary fuel. A minimum flue gas temperature of 800 C will be maintained to eliminate odor nuisances. The flue gases will be cooled to at least 350 C in steam boilers, and then led through an electrostatic precipitator for dust removal. The special chemical waste incineration plant, designed to comprise a rotary furnace, will provide a flue gas temperature of 1000 C, which will then be lowered to 400 C through the admission of cold outside air for subsequent purification. The flue gases will be led through an afterburning chamber into which liquid wastes may also be admitted.

30693 **APTIC NO. 53122**

Schoeppel, Roger J.

DESIGN CRITERIA FOR HYDROGEN BURNING ENGINES. (FINAL REPORT). *Oklahoma State Univ., Stillwater, School of Mechanical and Aerospace Engineering, Office of Air Programs Contract ESH 70-103, Rept. APTD-0901, 145p., Oct. 1971. 15 refs.*

NTIS: PB 205815

Laboratory experiments have demonstrated hydrogen not only to be an excellent substitute for conventional hydrocarbon fuels in internal combustion engines, but also to have the inherent qualities necessary for a permanent solution to the air pollution problem. This conclusion was reached after extensive tests were conducted with an air-cooled single-cylinder gasoline engine converted to run on hydrogen. The engine s operational characteristics compared favorable with those of its gasoline counterpart. Furthermore, the nitrogen oxide content of the exhaust was an order of magnitude lower than that expected from a gasoline engine. Trace amounts of unburned hydrocarbons and carbon oxides, also present, originated from the lubricating oil. It was concluded from these experiments that a multi-cylinder automotive engine converted to run on hydrogen should be able to meet the 1975/76 Federal emission standards. The effect of air/fuel ratio is mentioned. (Author abstract)

1970

30694 **APTIC NO. 52600**

Barker, Thomas

SOLVENT REFORMULATION IN GRAVURE. Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 47-54. (Nov. 18-19.)

Solvent formulations in gravure inks and their effect on air quality control, and various control methods are discussed. Several methods can be used to control emissions of solvent vapors to the atmosphere. These include adsorption of the vapors by a suitable substance such as activated carbon or silica gel, conversion of the vapors by catalyst or incineration to what might be termed less offensive emissions, or selectively emitting only those vapors which are not harmful to the atmosphere. Each of these methods is limited by what can and cannot be used as a solvent for the ink. Solvents are to be controlled for emissions of hydrocarbons, alcohols, aldehydes, esters and ketones that can be discharged into the atmosphere. The formulation of the various solvents to minimize these emissions is reviewed. Solubility factors and evaporation rates are considered. Additional data on solvents classification according to legislation, gravure ink types, use, physical properties of solvents, and the three chemical classes are given.

1969

30695 **APTIC NO. 53020**

Laskowski, W.

NATURAL DRAFT IN THE OPEN ELECTRIC-ARC FURNACES FOR THE PRODUCTION OF ALLOYS AND ITS EFFECT ON THE GRAIN-SIZE COMPOSITION OF THE EMITTED DUST. *(Ciag naturalny w otwartych elektrycznych piecach lukowych do produkcji stopow i jego wplyw na sklad ziarnowy emitowanego pylu). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 3(3):35-46, 1969. 3 refs.*

NTIS: TT 70-55123/3

Natural draft in the open electric arc furnaces for the production of iron alloys was discussed in terms of the Grabowski hydraulic theory of natural draft. The process of the formation of the gas-solid dispersion system was treated along with the effect of natural draft on the grain-size composition of the dusts. The conclusions from the discussion were compared with the results of measurements performed in 1967 in an Upper-Silesian works. The chemical composition of the dust is also described. (Author abstract modified)

1964

30696 **APTIC NO. 53366**

Schwarz

THE EMISSIONS OF INDUSTRIAL STEAM BOILER PLANTS AND PUBLIC POWER STATIONS, THE MAGNITUDE THEREOF AND MEASURES FOR THEIR REDUCTION. *Z Tech. Uberwach., 6(12):433-439, 1964. 17 refs. Translation from German, 19p.*

The emissions of industrial steam boiler plants, their magnitude, and measures for their reduction are discussed. Dust emission in Germany in 1962 from steam boilers was 0.773 times 10 to the 6th power tons or 1/3 of the total emission. An emission of 1.39 times 10 to the 6th power tons of sulfur dioxide or 35% of all SO2 emissions was reported for 1962 from the industrial and public supply services. Figures from England for 1962 cannot be directly compared, but 0.34 times 10 to the 6th power tons of smoke were ejected by railways and industry. This is 23% of the total figure. Emission of SO2 from electrical power stations was 2.15 times 10 to the 6th power tons, 25% of the total. In France during 1963, dust discharges from coal burning power stations were 37,000 tons, while SO2 was 141,000 tons. All three countries currently have legislation in effect for the improvement of the purity of the air. There are differences in emissions deriving from the various fuels: smoke and soot (pit coal, heavy oil); crude gas dust (ballast coal, lignite coal); SO2 and other gases (pit coal, ballast coal, heavy oil). Measures for the reduction of flue gas emissions include dust extraction, electro filters, and the modernizing of old equipment. There is no effective or economic process to eliminate SO2 emissions. The farthest developed is the Reinluft process which utilizes activated carbon. The process is expensive and requires a lot of space, but claims to be 90 to 95% effective. Ground level emissions are being limited by regulating the heights of smoke stacks and the velocity, quantity, and temperature of the gases. Both continuous and noncontinuous measurement techniques were established to insure complicity.

1963

30697 **APTIC NO. 52996**

Roggero, Carlos E.

HIGH TEMPERATURE FLUID BED ROASTING OF ZINC CONCENTRATES. *Trans. AIME (Am. Inst. Mining Metallurgical and Petroleum Engr.), 227(1):105-111, Feb. 1963. 8 refs.*

The influence of high temperatures on the zinc roasting practice in a zinc electrolytic refinery was investigated by full scale tests in fluid bed reactors operating at temperatures from 950-1150 C. Throughout the range, an increase in temperature resulted in a 2-3% increase in zinc solubility because of decreased content of zinc ferrite and lowered sulfide sulfur. The former was attributed to thermal decomposition of ZnFe2O4, and the latter to increased oxidation rates, and longer retention times. Data on the greatly increased volatilization and elimination of lead, cadmium, and silver above 1000 C are presented. A considerable fraction of the iron present in the feed was also transferred at high temperatures from the coarse roaster discharge to the flue dusts. The reduction of excess air during the fluid bed roasting increases sulfur dioxide production; the SO2 can then be converted to sulfuric acid for resale. If roasting temperature increases, dust and sulfide content decreases despite lower oxygen partial pressure. Dust is removed by cyclones and electrostatic precipitators. (Author abstract modified)

1961

30698 **APTIC NO. 53429**

VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany), Kommission Reinhaltung der Luft

SOURCES OF AIR-POLLUTING SUBSTANCES. *(Katalog der Quellen luftverunreinigender Stoffe). VDI (Ver. Deut. Ingr.) Richtlinien, No. 2090, Dec. 1961. Translated from German. Joint Publications Research Service, Washington, D. C., APTD-1472, 12p.*

NTIS: PB 221199-T

An enumeration of the principal sources of air-polluting substances is presented. The sources are arranged under the following industries: mining (lignite and ore), chemical and related, iron and steel plants and foundries, steel mills and refining plants, furnace installations for steam and power generation, mineral oil industry, stone and earth industry, processing plants for animal and vegetable products, other industries and commerce and agriculture, public technical installations, small industries and domestic heating, and transportation. The list includes such sources of air pollution in which, under the present status of technology, the prevention of emission is not yet possible or cannot be achieved at an economically bearable cost.

CONTROL METHODS

1973

30699 **APTIC NO. 52721**

Society of Automotive Engineers (Japan)

REDUCTION OF AUTOMOBILE EXHAUST. *(Jidosha haishutsugasu no teigen ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(7):673-677, July 1973.*

Automotive emissions consist of exhaust gas, blow-by gas, and evaporation gas. Controls to reduce hydrocarbons from blow-by gas and evaporation gas have already been effected. Exhaust emissions, however, still remain a problem. If carbon monoxide and hydrocarbons are completely combusted using a thin mixing ratio, the amount of exhaust is reduced but the emission of nitrogen oxides increases. With a rich ratio, however, the amount of NOx decreases but the amount of CO and hydrocarbons increases. With an extremely lean mixing ratio, concentrations of all the pollutants decrease, but combustion is not complete and results in engine operating problems.

30700 **APTIC NO. 52897**

Industrial Technology Council (Japan)

NEW DEVELOPMENT OF INDUSTRIAL TECHNOLOGY FOR NATIONAL WELFARE. *(Kokumin fukushi no tameno sangyo gijutsu no shintenkai). Text in Japanese. Tsusansho Koho (Gaz. Minist. Int. Trade Ind.), no. 7116:17-22, Aug. 7, 1973.*

New technology to reduce pollution is described. Social and economic factors which affect the control of air pollution are mentioned. Nitrogen oxides control, closed industrial process systems, solar energy, and research and development programs are mentioned.

30701 **APTIC NO. 52900**

CLEAN AIR MAINTENANCE DURING METAL DEGREASING OPERATIONS WITH THE APPLICATION OF CHLORINATED HYDROCARBONS. *(Reinhaltung der Luft bei der Metallentfettung mit chlorierten Kohlenwasserstoffen). Text in German. Fachber. Oberflaechentech., 11(6):178-179, June 1973.*

The possibility of clean air maintenance by means of activated carbon during metal degreasing operations using chlorinated hydrocarbons such as trichloroethylene, perchloroethylene, 1,1,1-trichloroethane, and methylene chloride, is described. Such solvent vapors, released by metal degreasing operations, can be removed from the air by means of activated carbon at efficiencies reaching nearly 100%. The chlorinated hydrocarbons adsorbed on the activated carbon can be desorbed by means of water vapor, which helps cut solvent costs for degreasing. Reactors using activated carbon for the adsorption of chlorinated solvent vapors from the air are usually composed of two adsorbers, one of which is being used for adsorption, while another adsorber is being subjected to desorption. Aside from chlorinated hydrocarbons, gasoline, hexane, toluene, alcohols, benzene, xylene, ketones, esters, acetate and their derivatives can be efficiently adsorbed by means of activated carbon.

30702 **APTIC NO. 53151**

Office of Air and Water Programs, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

CONTROL TECHNIQUES FOR MERCURY EMISSIONS FROM EXTRACTION AND CHLOR-ALKALI PLANTS. *Pub-AP-118, 76p., Feb. 1973. 52 refs.*

NTIS: PB 220473; GPO

The toxicity and high volatility of mercury have led to a review of two sources of mercury emissions, the primary mercury processing industry and the mercury-cell chlor-alkali industry. An effort has been made to identify the process steps that may produce atmospheric mercury emissions, to summarize the emission control techniques and low mercury emission processes used or applicable to these industries, and to evaluate these techniques in terms of cost and effectiveness. The condenser gas stream is the major source of mercury emissions from primary mercury processing plants. Process changes that inherently produce fewer emissions include beneficiation of ore, retort processing, and hydrometallurgical processing. Appropriate control techniques include cooling and mist elimination, wet scrubbing, or adsorption beds. Major emissions of mercury from chlor-alkali plants using mercury cells are from the hydrogen gas stream, the end-box ventilation stream, and the cell room ventilation air. The emissions from all sources can be eliminated by converting to the diaphragm-cell process. The cost of converting a 100-ton-per-day plant is estimated to range from $3,700,000 to $8,000,000. Mercury emissions can also be reduced by the installation of control systems and the use of good housekeeping practices. The hydrogen gas and the end-box ventilation air streams can be treated by cooling and mist elimination, chemical scrubbing, or adsorption beds. Costs for the various control systems are cited.

30703 **APTIC NO. 53263**

PRESENT STATE AND PROSPECT OF NITROGEN OXIDES CONTROL MEASURES IN ELECTRIC POWER INDUSTRY. *(Denryokugyokai ni okeru NOx taisaku no genjo to tembo). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 2(8):28-34, Aug. 1973.*

Nitrogen oxides concentrations from boilers ranging from 35-600 MW output were measured in Japan in 1972. The NOx values were 270-960 ppm (647 ppm average) for coal-burning boilers, 210-510 ppm (347 ppm average) for coal and heavy oil, 180-560 ppm (289 ppm average) for heavy oil and crude oil), and 170-210 ppm (191 ppm average) for fuel gases. The type of fuel thus greatly affects NOx emission. Present NOx control methods center around combustion improvements, including two-stage combustion, low excess air combustion, and exhaust gas recirculation. Two-stage combustion is used at 26% of the oil-burning boilers in Japan and 30% in the U. S. Boilers in Japan are normally operated with 1% oxygen, so further low excess air combustion cannot be obtained.

30704 **APTIC NO. 53414**

Office of Air and Water Programs, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

CONTROL TECHNIQUES FOR ASBESTOS AIR POLLUTANTS. *103p., Feb. 1973. 57 refs.*

NTIS: PB 222020; GPO

The subdivision of asbestos into fine fibers produces particulate matter that is readily dispersed into the atmosphere. Adverse effects of airborne asbestos on human health have been associated primarily with direct and indirect occupational exposures, but a level of asbestos exposure below which there is no detectable risk of adverse health effects to the general population has not yet been identified. Because of the lack of a practical technique of adequate sensitivity for measuring small concentrations of airborne asbestos, neither accurate emission factors nor emission-effect relationships are available. Engineering appraisals, based on limited data, indicate that the milling and basic processing of asbestos ore (crushing and screening the ore and aspirating the fiber to cyclones for grading) and the manufacture of asbestos-containing friction materials, asbestos-cement products, vinyl-asbestos tile, asbestos textiles, and asbestos paper account for over 85% of the total emissions. In most of the manufacturing operations, the major emissions of asbestos occur when the dry asbestos is being handled, mixed with other dry materials, or dumped into the wet product mix, but the weaving of asbestos fibers into textiles and the machining or sanding of hard asbestos products also produce major emissions. Emissions are controlled by careful handling of dry materials to avoid generating dust; by enclosing dusty operations; by substituting wet processes for dry processes; by wetting dry materials before handling, sawing, or grinding; by cleaning the dust-laden air by drawing it into ducts that lead to fabric filters; and by reducing the amount of asbestos added to products the use of which leads to the generation of emissions. The last technique is particularly applicable to situations where the control of emissions by other methods is very difficult, as with spray application of insulation or demolition of structures. The costs of needed emission control techniques can be estimated from those associated with existing practices.

30705 **APTIC NO. 53076**

Acres, G. J. K., B. S. Cooper, and G. L. Matlack

THE PRODUCTION OF AUTOMOBILE EMISSION CONTROL CATALYSTS: GLOBAL CAPABILITY OF THE JOHNSON MATTHEY GROUP. *Platinum Metals Rev., 17(3):82-87, July 1973. 5 refs.*

International concern over the environmental pollution caused by the internal combustion engine has induced legislation directed towards reducing the levels of carbon monoxide, unburned hydrocarbons, and nitrogen oxides in the exhaust gas stream released to the atmosphere from the engine burning gasoline. Experience within the Johnson Matthey Group has indicated that platinum based catalyst systems offer the best method for controlling automobile exhaust emissions. These catalyst systems consist of promoted platinum metals supported on honeycomb ceramic supports. There are two varieties: an oxidation type catalyst which is used to remove CO and HC from the exhaust gas stream; and a reduction type which is used to control NOx. They possess characteristics such as low ignition temperature, high thermal stability, and good shock resistance and are able to meet the emission standards laid down by the Environmental Protection Agency for 1975 and 1976. Further, it is feasible to construct production facilities within the EPA time scale. The three major American automobile companies have announced that they will fit catalytic converters to all 1975 model cars sold in California and to some sold in other states. The Japanese government is also insisting that catalytic afterburners be installed on all cars with engines of 1800 cc capacity or more that are in use as of April 1, 1973. Having shown the feasibility of their system, the Johnson Matthey Group is striving to optimize its features, particularly its durability. Plans for the mass production of catalyst units are under way, and it seems that sufficient platinum will be available to satisfy the needs of the automobile industry.

30706 **APTIC NO. 53287**

Baron, R. Grollier

PROCEDURE FOR THE PURIFICATION OF WASTE GASES IN SULFURIC ACID MANUFACTURING PLANTS. *(Procede pour l epuration des fumees d usines a soufre). Text in French. Chim. Ind., Genie Chim., 106(7):479-481, March 1973.*

A procedure is presented for the purification of sulfur dioxide-containing gases emanating from factories in which catalytic operations are carried out for refining petroleum, or where natural gas is treated. The procedure has been developed by the French Institute of Petroleum (I.F.P.) and is based on the basic classical reaction described by Claus. The formation of elemental sulfur from the interaction of hydrogen sulfide and sulfur dioxide serves to prevent the poisonous sulfur gases from reaching the atmosphere in toxic quantities. The procedure makes possible the recovery of 99.5% of the sulfur produced in the form of H2S by conducting the Claus reaction at a low temperature, between 115 and 150 C; this is done with the aid of a catalyst. Thus, the procedure is based upon the contact between the gas and a heavy solvent containing a catalyst, a contact which is effected by a specially designed column, a circulation pump, and a heating system designed for this purpose. The solvent used must possess stable thermic and chemical properties in relation to sulfur or its compounds, must have suitable physical properties for a good gas/liquid contact, a low vapor pressure, must be available at low cost, must be nontoxic, must be only very slightly soluble in sulfur, and must not dissolve sulfur.

30707 **APTIC NO. 52791**

Beeckmans, J. M.

A TWO-DIMENSIONAL TURBULENT DIFFUSION MODEL OF THE REVERSE FLOW CYCLONE. *Aerosol Sci., vol. 4:329-336, 1973. 6 refs.*

A two-dimensional theory of cyclone performance is presented. It is based on the mathematical expression for the mean turbulent diffusivity ratio in the cyclone. The model takes into account concentration variations in the axial and radial directions. The theory was used to predict the grade efficiency curves of two cyclones for which experimental grade efficiencies were determined. The calculated grade curves were above the experimental ones, but the agreement was acceptable for both cyclones. (Author abstract)

30708 **APTIC NO. 53294**

Brille, Maurice

THE TRENDS OF THE AUTOMOBILE ENGINE. 2. DADS AND GRANDPA S ENGINES. *(Ou va le moteur d automobile? 2. Moteurs de papa et de grand-papa). Text in French. Ing. Tech. no. 274:50-54, April 1973.*

As part of a series of articles dealing with air pollution caused by automobile motors, internal combustion motors and gas turbines are described. Internal combustion includes discontinuous as well as continuous combustion, the former being the source of energy used in modern automobiles. The discontinuity of the cycle permits the use of a cylinder piston assembly successively as a compressor and motor. As a representative of continuous combustion, the turbine is discussed; this source of energy has been proposed for automobiles of the future as a means of reducing air pollution associated with this source. Although a great deal of research has been carried out on this project, a number of technical difficulties have cropped up which have not been overcome. One of these difficulties concerns the air pollution emitted at the start of the operation; another is noise. Other disadvantages of the turbine engine as applied to cars are the requirement of pure air and, thus far, their uncertain reliability for automobiles. In general, this type of change in the automobile is not considered realistic at present.

30709 **APTIC NO. 53554**

Brooks, Ralph J.

MOBILE AIR POLLUTION REDUCTION SYSTEM AND METHOD. *(Assignee not given.) U. S. Pat. 3,719,028. 9p., March 6, 1973. 4 refs. (Appl. June 16, 1971, 28 claims).*

A mobile air pollution reduction method and system has been designed to allow for incorporation into a truck body and disengagement from a main chassis for utilization at an operating station. The unit is connected through inlet and exhaust conduits to a chimney, stack, or flue when left in place. The inlet conduit includes an interrupt mechanism to deflect waste gases into the unit. Gases injected to the unit are forced through a predetermined path where they are subjected to a high pressure fluid stream which captures solid particles contained in the gases within the intercepting fluid. The cleaned gases and contaminated fluid are directed to a sump where the fluid is cleaned and recirculated through the system. The gases are then passed through a final filter and exhausted to the atmosphere. The fluid may also be passed into a cooling system before being recirculated. A combustion chamber may be added to the system if incoming waste gases are only partially burned. (Author abstract modified)

30710 **APTIC NO. 53508**

Charlton, Jaehn B.

EXHAUST POLLUTION CONTROL SYSTEM. *(Assignee not given.) U. S. Pat. 3,712,029. 10p., Jan. 23, 1973. 18 refs. (Appl. June 25, 1970, 14 claims).*

An internal combustion engine cleaning system which has three types of cleaning elements: a dry-scrubber cleaning element; a wet-scrubber cleaning element; and a filter cleaning element is disclosed. Cleaning members in each of the cleaning elements can be individually removed and replaced. The dry-scrubber cleaning element comprises insert tube cleaning members which can be removed from an outer housing for replacement. The dry scrubber cleaning element further includes electrodes and magnets to attract magnetic pollutants. The wet-scrubber cleaning element comprises a tank, a liquid agent held in a sponge, and a copper surface plate. The filter cleaning element comprises a removable filter element mounted in a housing. The present invention, bu utilizing all three of the major types of exhaust cleaning elements, overcomes the disadvantage of previous devices in being more effective for some pollutants than others. The employment of inexpensive reacting materials (charcoal silica brick, ground glass, magnesium shavings, aluminum, stainless steel, and fiberglass) is yeat another advantage relative to other such devices. (Author abstract modified)

30711 **APTIC NO. 53093**

Chilton, Thomas H.

ABATEMENT OF POLLUTION OF THE ATMOSPHERE FROM STATIONARY COMBUSTION SOURCES. *Chim. Ind., Genie Chim., 106(11):785-790, May/June 1973. 1 ref. (Presented at the Congres Le Genie Chimique au Service de l Homme, Paris, France, Sept. 1972.)*

The combustion of fuels results in the emission to the atmosphere of particulate matter (soot or smoke, unburned fuel, and fly ash) and noxious gases (sulfur oxides, and nitrogen oxides). Particulates can be removed by electrostatic precipitators. Sulfur might best be removed from the fuel, a procedure which is technically feasible if expensive. Elimination of sulfur during the combustion process may eventually be possible, perhaps by fluidized bed combustion. However, some adaptation of standard chemical engineering techniques may have to be used in the meantime to effect absorption of sulfur dioxide from the stack gases. Nitrogen oxide emissions can be most effectively reduced by combustion modifications which limit the maximum temperature and so minimize the fixation of nitrogen in the flame. It is not apparent how present absorption technology could be used to deal with these gases. Regulatory actions regarding these pollutants are mentioned.

30712 **APTIC NO. 53236**

Dalaker, Olav

FLUE GAS CLEANING IN WASTE INCINERATOR PLANTS. *(Rokgassrensing ved avfallsforbrenning). Text in Norwegian. Tidsskr. Kjemi Bergvesen, Met., 33(3):24, 27-28, 34, March 15, 1973.*

Problems of air pollution generated by waste incinerator plants, and practical solutions to this problem are described. Waste incineration is conducted at an oxygen excess of 100%. The air pollutants present in waste incinerator-generated flue gases are composed mainly of hydrochloric acid, sulfur dioxide, dust, soot, and metal oxides, all amounting to some 0.03% of the flue gas volume. Flue gas analyses at an Oslo waste incinerator plant revealed 10% soot, 40% silica, 15% iron oxide, 10% aluminum oxide, 10% calcia, and small quantities of potassium, sodium oxides, and heavy metals. Odorous compounds formed in the course of incineration are destructed at temperatures exceeding 800 C. Multicyclones currently in use have dust separation efficiences of around 90%. Large-capacity incinerator plants are preferably equipped with electrostatic precipitators that reach efficiencies of 95-99%. Scrubbing with sodium hydroxide as an additive in the scrubbing water at a pH value of 10-11, or with sea water, has a SO2 separation efficiency of 95-98%, and, at the same time, high dust separation efficiency. Some 80-90% of the total SO2 emission can be adsorbed by the use of manganese oxide, soda, aluminum oxide, or magnesium oxide as additives to be used in the combustion process.

30713 **APTIC NO. 52726**

Doi, Shimakichi

PRACTICAL ESTABLISHMENT OF A WET TYPE SULFUR REMOVAL PROCESS FOR COAL FIRED BOILER IN LARGE SCALE. *(Shisshiki karushiumu hoshiki ogata haien datsuryu no sekitan sensi karyoku ni okeru jitsuyoka). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan, Tokyo), 52(555):618-624, July 1973.*

Electric energy for a Japanese aluminum smelter is provided by a 156 mw boiler burning coal with a high sulfur content and low melting point ash. After various investigations and a pilot plant study, a wet sulfur removal process using carbide sludges was adopted to control sulfur emissions to the atmosphere and to avoid clinker problems. Distinctive features of the process include limited space requirements, low construction and operating costs, simplicity, absence of harmful by-products, high sulfur and dust removal efficiency, and ready availability of the calcium hydroxide absorbent. Since coal can be consumed continuously in large quantities, the smelter has operated trouble free since its start-up in 1972.

30714 **APTIC NO. 53549**

Doyle, Lawrence O., Jr. and Harlen D. Meek

FILTERING APPARATUS. *(Anti-Pollution Devices, Inc., Hopkins, Minn.) U. S. Pat. 3,716,967. 6p., Feb. 20, 1973. 6 refs. (Appl. Sept. 11, 1970, 6 claims).*

A filtering apparatus adapted to be connected to a burner apparatus of the furnace type in buildings to remove fly ash, smoke, and other contaminant particles from the flue gases or discharge gases is presented. It includes three stages of filtration, the first being a cyclone type separator and the second and third stages being mechanical filters. An exhaust or blower assembly is mounted on the casing to draw gases through the filtering apparatus from the chimney. Operation of the device is automatic by a temperature sensor in the apparatus which is connected to the chimney by means of transverse duct work. An air inlet is provided in the transverse duct work to draw ambient air along with the gases for cooling the gases as they pass through the filtering apparatus. The filtering device is simplified in construction and can be placed in any location relative to the furnaces. It is also low in cost and easy to service and maintain. (Author abstract modified)

30715 **APTIC NO. 53463**

Dumont, G., W. Goossens, A. Taeymans, and W. Balleux

APPLICATION OF A FLUIDIZED BED IN THE PURIFICATION OF FLUE GASES. *(Toepassing van een gefluidizeerd bed voor het zuiveren van verbrandingsgassen). Text in Dutch. Ingenieursblad, 42(10):318-322, May 1973. 4 refs.*

Applications of fluidized beds in the purification of soot-loaded flue gases are described. A two-stage fluidized bed with alumina particles of a mean diameter of 150 micron and a bed height of 40 cm was built for experimental purposes. Another fluidized bed reactor, filled with sand particles of 220 micron in diameter in a 20 cm layer, had a soot capture efficiency of nearly 100%. Combinations of panel filters with sand-filled fluidized bed reactors proved suitable for the purification of combustion gases, such as incineration furnace gases. The flue gases from a furnace burning polyethylene grains were passed through a sand-filled fluidized bed of 30 cm thickness at 900 C and through a cyclone for the retention of sand particles.

30716 **APTIC NO. 52744**

Engels, Lothar-H.

DUST TECHNOLOGY. PROCESSES -- PERFORMANCE -- COSTS. *(Enstaubungstechnik. Verfahren -- Leistung -- Aufwand). Text in German. TUE Tech. Ueberwach., 14(8):224-229, 1973.*

A review of the most common types of dust collectors such as centrifugal separators, scrubbers, cloth filters, and electrostatic precipitators is given. The costs of the various dust collection methods in relation to collection efficiency are indicated by a graph. As a basis for the specific investment costs, a throughput of 100,000 cu m/hr is taken. The graph shows that with increasing collection efficiency the costs for the various collectors rise to a different extent. The primary costs for dust collection systems with a collection efficiency between 95-99.8% range from $2.90/cu m hourly cleaned gas quantity for the simplest system to $20.30/cu m for the most sophisticated method. The specific primary costs change in dependence on throughput. This change is of the same order of magnitude for all methods. With increasing throughput the specific costs drop. A graph plotting the total costs (investment plus operating costs) vs. the collection efficiency shows clearly the interdependency of method, efficiency, and cost.

30717 **APTIC NO. 53558**

Fillies, Friedrich and Guenter Urban

ELECTROFILTER INSULATOR WITHOUT DAMAGING DUST DEPOSITS. *(Fried Krupp Gesellschaft mit beschrankter Haftung, Essen (West Germany)) U. S. Pat. 3,714,762. 3p., Feb. 6, 1973. 16 refs. (Appl. Aug. 28, 1970, 5 claims).*

A method for preventing damaging dust deposits on insulators of an electrofilter used primarily for removal of pyrophoric dusts has been accomplished by means of feeding a hot oxidizing gas to the insulators and adjusting the temperature of the gas so that the specific weight of it is less than that of the gas from which the dust is to be removed. The hot oxidizing gas is produced by burning a fuel in a burner and subsequently admixing the resulting burned fuel with air. The oxidizing effect of the gas converts the dust particles (consisting essentially of ferrous oxide), which still reach the surface of the insulator under the influence of electrical field forces, into ferric oxide. The Fe_2O_3 adheres only loosely and leaves no melting track (resulting from electrical spark-overs) which would lead to the destruction of the insulator. (Author abstract modified)

30718 **APTIC NO. 52871**

Frank, H. G.

OXIDATION OF BLACK LIQUOR IN SULFATE PULP MILLS, A CONTRIBUTION TO THE PROBLEM OF ENVIRONMENTAL PROTECTION. *(Die Oxidation von Schwarzlauge in Sulfatzellstoff-Fabriken, ein Beitrag zum Thema Umweltschutz). Text in German. Wochenbl. Papierfabr., 101(8):271-273, April 1973. 8 refs.*

Black liquor oxidation is an integral procedure in sulfate mills to reduce sulfur losses and the emission of malodorous sulfuric gases, which are associated with the sulfate pulping process. Based on chemical equations, the formation of gaseous sulfur and odorous gases was demonstrated, along with the efficiency of black liquor oxidation to reduce both sulfur losses and odorous gases. The economic advantages of the process are reviewed. The design and operating variables of an oxidation plant are presented.

30719 **APTIC NO. 52945**

Friedrichs, Hans Adolf and Ottmar Knacke

ADSORPTION OF SULPHUR DIOXIDE AND FORMATION OF SULPHATES ON OXIDES. *(Adsorption von Schwefeldioxid und Sulfatbildung an Oxiden). Text in German. Arch. Eisenhuettenw., 44(2):125-129, Feb. 1973. 40 refs.*

Combustion tests with an oil burner burning approximately 3 l/hr fuel and emitting approximately 42 N cu m/hr revealed that the addition to the fuel of oil-soluble additives in the form of metallo-organic substances like naphtenates and octanates containing 3-12% metal reduced the sulfur content in the flue gases by formation of solid sulfates. The efficiency of the additives increased in the order magnesium, zinc, manganese, calcium, and barium. Stoichiometric addition of barium resulted in the separation of 80% sulfur as barium sulfate. All additives, even oil-soluble silicons which do not reduce the sulfur content of the flue gas, influenced the sulfur dioxide: sulfur trioxide ratio in flue gases in favor of the dioxide. Silicons provided protection against catastrophic corrosion by liquid sulfates by raising the melting point of sulfatic corrosion products. These test results may be explained by thermodynamic considerations of phase boundaries for metal oxides, sulfides, and sulfates; kinetic processes also exert an influence on sulfate cover layer formation. Adsorption tests involving pure SO_2 and fine-grained magnesium oxide revealed that no desulfurization can be achieved in this way because the quantities of magnesium oxide that would be required are impossibly large.

30720 **APTIC NO. 53553**

Fry, Lloyd A., Sr.

POLLUTION CONTROL PROCESS. *(Lloyd A. Fry Roofing Co., Summit, Ill.) U. S. Pat. 3,724,173. 9p., April 3, 1973. 9 refs. (Appl. March 24, 1971, 8 claims).*

A pollution control process for substantially reducing the particulate emission, opacity, and odor of an asphalt saturator effluent is presented. The process forms a substantially odor-free gas stream using an exhaust stack stream that was previously purified for recycling in the process. The following stages are included in the process: passing the effluent into a first contacting zone where the effluent is contacted with a contacting fluid and conditions; withdrawing from the contacting zone a fluid stream composed of hydrocarbonaceous particles and finely divided suspended particulates and introducing the fluid stream into a first separation zone in which the hydrocarbons and particulates are separated from the stream; introduction of the stream into a second separation zone to produce an odor-free stream; introducing the stream into the exhaust stacks; recycling a portion of the stream from the exhaust stacks into a second contacting zone for eventual admixture with the effluent in the first contacting zone; and removing via the exhaust stack the remaining portion of the odor-free gaseous stream.

30721 **APTIC NO. 52924**

Furukawa, Akiishi

BAG FILTERS FROM THE TECHNICAL POINT OF VIEW. *(Baggufiruta no genjo). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(7):43-50, July 1973. 5 refs.*

Bag filters include mechanical vibrating, adverse wind, normal and adverse wind (air pulsation), reverse jet, and pulse air types. These types are discussed including efficiency, dust removal, filter fabrics, and operating variables.

30722 **APTIC NO. 53555**

Gelfand, Peter C.

ELECTRIC FIELD DIRECTED CONTROL OF DUST IN ELECTROSTATIC PRECIPITATORS. *(Envirotech Corp., Salt Lake City, Utah) U. S. Pat. 3,719,031. 6p., March 6, 1973. 2 refs. (Appl. June 8, 1971, 7 claims).*

An electrostatic precipitator for removing dust particles suspended in air or other gases has been specifically designed to prevent re-entrainment of dust that has been collected in the hopper or carried by gas near its entrance. A downwardly directed corona discharge is produced in the lower portion of the precipitator chamber in the direction of the hoppers. An array of corona discharge points disposed along the lower portion of the precipitator chamber are adapted to be energized by a high voltage source. The electric field and corona discharge produced between the corona points and the grid, in the direction of the hopper, sets a so-called electric wind in that direction which aids the gravitational force acting on the dust particles so that they will be effectively conveyed into the hopper. Once in the hoppers, the dust particles are prevented from re-entering the precipitator chamber because the electric wind counteracts the effects of the flowing gas or any sudden gusts of wind that might blow the particles up from the bottom of the hoppers. (Author abstract modified)

30723 **APTIC NO. 53572**

Genton, Richard G.

AIR FILTER AND DUST COLLECTOR. *(Assignee not given.) U. S. Pat. 3,710,552. 5p., Jan. 16, 1973. 5 refs. (Appl. Aug. 27, 1970, 2 claims).*

A dry air filter and dust collector employing fabric cylinders through which air is drawn from the outside to the inside has been designed to overcome the disadvantages of other such devices relating to needless complexity and ineffective cleaning means by a process of stopping the flow of filtering air without substantially reversing its flow and shaking the fabric cylinders to remove dust trapped thereon without disturbing the tension on the cylinders. The fabric cylinders are tensioned at the bottom and mounted to permit shrinking and stretching of the fabric while maintaining constant tension. The shaking movements are applied to the bottom of the filter cylinders. A source of low pressure air for the top of the fabric cylinder may oppose flow of the air to be filtered so that the dust will not be held against the fabric surface. The structure results in improved operating efficiency and prolonged life of the fabric filters.

30724 **APTIC NO. 52756**

Gidaspow, Dimitri and Michael Onischak

REGENERATIVE SORPTION OF NITRIC OXIDE: A CONCEPT FOR ENVIRONMENTAL CONTROL AND KINETICS FOR FERROUS SORBENTS. *Can. J. Chem. Eng., 51(5):337-344, June 1973. 39 refs. (Presented at the Canadian Chemical Engineering Conference, 22nd, Toronto, Ontario, Sept. 17-20, 1972.)*

To be effective in removing nitric oxide from flue gases, a sorbent must be regenerative and must not preferentially react with carbon dioxide and water vapor; ferrous salts are promising in these respects. Ferrous sulfate and nitric oxide form a complex which can be decomposed with hot gases. Before the size of a sorber needed for a given job can be determined, rates of sorption must be calculated. Rates of sorption in the ppm nitric oxide concentration range using a parallel plate reactor are presented for two ferrous sulfate silica gel sorbents. Both sorbents contained about 24% ferrous sulfate and about 19% lithium chloride on a free water basis. The silica gel support used for the second was platinized. Rates of sorption with and without platinum differed little; however, the platinum (or some other catalyst that sorbs hydrogen) was needed for regeneration. The rates are sufficiently fast that it is possible to construct a small regenerator to remove nitric oxide contained in small concentrations from gaseous mixtures. A kinetic model that correlates all observed room temperature data is derived.

30725 **APTIC NO. 53214**

Haani, M. and A. Kuivala

MERCURY FROM ROASTING GAS. *(Kvicksilver ur rostgas). Text in Swedish. Tidskr., 85(5):58-60, May 1973. 2 refs.*

A new method for the quantitative removal and utilization of mercury, present in zinc sulfide ore roasting (smelting) gases, is described. The roasting gases, having a temperature of 950 C immediately after roasting, contain practically all the mercury in elementary form in concentrations of 10-80 mg/cu m. The temperature is reduced to 350 C to remove mercury, and the dust content is reduced to about 100 mg/cu m by means of cyclones and electrostatic precipitators. The mercury-containing gases from the electrostatic separator are treated with sulfuric acid of at least 80% concentration during which mercury, selenium, and the residual dust are washed out by the acid. The gases leaving the sulfatizing tower at a temperature of 180 C, and containing less than 0.2 mg of elementary mercury per cu m, are combined with normal roasting gas to be sent to a normal gas scrubber for scrubbing with 30% H2SO4. The temperature is lowered to 60-70 C for the abatement of the chlorine content. The mercury sulfate, present in the sulfuric acid is recovered by filtration and concentration, and reduced to elementary sulfur.

30726 **APTIC NO. 52706**

Haas, L. A. and S. E. Khalafalla

KINETIC EVIDENCE OF A REACTIVE INTERMEDIATE IN REDUCTION OF SO2 WITH CO. *J. Catalysis, 29(2):264-269, 1973. 8 refs.*

Rates of sulfur dioxide reduction with carbon monoxide on single beds of iron/silica, Fe/alumina, and Fe/SiO2/Al2O3 catalysts were measured. Under comparable conditions, the SO2 reduction was much greater when both Fe and Al2O3 were present. The results could not be explained on the basis of additivity of the separate catalytic contributions of the individual components of the mixtures. Experimental data indicate that a cooperative effect between the Fe and Al2O3 component is involved. The exhaust carbonyl sulfide concentration from a single catalyst layer containing Fe was still quite large at 400 C. However, when a second layer of pure Al2O3 was present, the COS exhaust concentration decreased by a factor of 10. These results suggest that a COS intermediate is first formed on the Fe site. This intermediate then is removed by the alumina component which acts as a catalyst for the COS-SO2 reaction. The stepwise reactions at separate active centers explain why both Fe and Al2O3 are needed to catalyze the reduction of SO2 with CO to yield elemental sulfur and carbon dioxide. (Author abstract modified)

30727 **APTIC NO. 52935**

Haas, Larry A.

SULFUR DIOXIDE: ITS CHEMISTRY AS RELATED TO METHODS FOR REMOVING IT FROM WASTE GASES. *Bureau of Mines Information Circ., no. 8608:1-19, 1973. 56 refs.*

Chemical sulfur dioxide removal processes can be divided into four groups: liquefaction; dissolution to form sulfurous acid, sulfites, and bisulfites; oxidation to sulfates and pyrosulfates; and reduction to sulfides, thionates, and sulfur. Methods that involve reducing SO2 to elemental sulfur appear promising since this product can be easily handled, shipped, and stockpiled. However, SO2 cannot always be reduced directly when other oxidizing agents are present. Thermodynamic data indicate that some oxidizing reagents will also consume reductant at the reduction temperature. A two-stage process can be applied to waste gases that contain excessive quantities of oxygen, nitrogen oxides, and water vapor. The best sorbent for the first stage is a nonalkali or nonalkaline earth medium since it more readily releases the SO2 for reduction in the second stage. Free energy of formation data indicate that the carbon monoxide plus SO2 reaction is more favorable than the hydrogen plus SO2 reaction. With CO, the reaction is only slightly reversible and a single isothermal reactor is sufficient. This reductant simultaneously reduces SO2 and NOx to elemental sulfur, nitrogen, and carbon dioxide at moderate temperatures (400 C). The reduction rate is enhanced in the presence of catalysts such as alumina-metal sulfide. (Author abstract modified)

30728 **APTIC NO. 53543**

Hamersma, J. W., E. P. Koutsoukos, M. L. Kraft, R. A. Meyers, G. J. Ogle, and L. J. Van Nice

CHEMICAL DESULFURIZATION OF COAL: REPORT OF BENCH-SCALE DEVELOPMENTS. VOLUME 1. *TRW, Inc., Redondo Beach, Calif., Systems Group, Environmental Protection Agency, Office of Research and Monitoring Contract EHSD 71-7, Program Element 1A2013, Proj. 21ADD-96, Rept. EPA-R2-73-173a, 181p., Feb. 1973. 17 refs.*

NTIS: PB 221405

Bench-scale and laboratory tests were conducted for chemical removal of sulfur from coal. About 100% of pyritic sulfur was removed, using aqueous ferric salt solutions which, for the four coals tested, corresponded to an absolute removal of 1-3.5% by coal weight of sulfur. The heat content of the coal increased and the ash content decreased as a result of pyrite removal. The pyritic sulfur was removed from the coal as elemental sulfur (40 mole %) and iron sulfate (60 mole%). Process operating temperatures of 150-130 C, pressures of 1-10 atm, residence time of 1-16 hr, and coal top sizes from 1/4 in. to 100 mesh were evaluated. Preliminary process design and cost estimation for a 100 ton/hr coal desulfurization plant indicated a cost of $2-3/ton of coal for removal of pyritic sulfur from unwashed Appalachian or Eastern Interior Basin coals, depending on the amount of sulfur removal required to produce a fuel which will comply with air quality regulations for fuel combustion and on any excess ferric ion consumption. Results of organic sulfur removal tests indicated that additional studies are necessary before process feasibility can be assessed. (Author abstract)

30729 **APTIC NO. 53544**

Hamersma, J. W., E. P. Koutsoukos, M. L. Kraft, R. A. Meyers, G. J. Ogle, and L. J. Van Nice

CHEMICAL DESULFURIZATION OF COAL: REPORT OF BENCH-SCALE DEVELOPMENTS. VOLUME 2. *TRW. Inc., Redondo Beach, Calif., Systems Group, Environmental Protection Agency, Office of Research and Monitoring Contract EHSD 71-7, Program Element 1A2013 Proj. 21ADD-96, EPA-R2-73-173b, 84p., Feb. 1973.*

NTIS: PB 221406

Bench-scale and laboratory tests were conducted for chemical removal of sulfur from coal. Approximately 100% of pyritic S was removed, using aqueous ferric salt solutions which, for the four coals tested, corresponded to an absolute removal of 1-3.5% by coal weight of S. The heat content of the coal increased and the ash content decreased as a result of the pyrite removal. The pyritic S was removed from the coal as elemental S (40 mole %) and iron sulfate (60 mole %). Process operating temperatures of 50-130 C, pressures of 1-10 atm, residence times of 1-16 hr, and coal top sizes from 1/4-in. to 100 mesh were evaluated. Preliminary process design and cost estimation for a 100-ton/hr coal desulfurization plant indicated a cost of $2-3/ton of coal for removal of pyritic S from unwashed Appalachian or Eastern Interior Basin coals, depending on the amount of S removal required to produce a fuel which will comply with air quality regulations for fuel combustion and on any excess ferric ion consumption. Results of organic S removal tests indicate that additional studies are necessary before process feasibility can be assessed. (Author abstract)

30730 **APTIC NO. 53232**

Harima, Mikio

GASIFICATION DESULFURIZATION. *(Gasuka Datsuryu ni tsuite). Text in Japanese. Kankyo Sozo (Environ. Creation), 3(6):56-66, June 1973.*

Gasification produces clean fuel gas by removing the sulfur. Heavy oil is gasified by processes like catalytic cracking, pyrolysis, or partial oxidation. Typical gasification methods include: the Gulf process using a catalytic moving bed for cracking (gasoline is the main product); the partial oxidation method which produces carbon monoxide, hydrogen, and methane (generated hydrogen sulfide and carbonyl sulfide are removed by absorption); the Ube method which is a partial oxidation process with low reaction temperature (more olefins and paraffins are produced than in the usual partial oxidation method and light oil is produced); the flexicoking method which pyrolyzes heavy oil into gas and light oil (the coke produced is gasified further to hydrogen, water, CO, and carbon dioxide which are used as a fuel for pyrolysis); and fixed bed catalytic cracking processes.

30731 **APTIC NO. 53262**

Hasegawa, Yoji

STATE OF NITROGEN OXIDES (NOX) CONTROL TECHNIQUES DEVELOPMENTS. *(Chissosankabutsu (NOx) no bojogijutsu haihatsu jokyo). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 2(8):21-27, Aug. 1973. 9 refs.*

Combustion improvements for nitrogen oxide control include lowering flame temperature, low excess air, shortening time in flames, burner adjustment, water injection, lowering thermal load, two-stage combustion, and exhaust gas recirculation. Emission gases can also be treated for denitration by contact reduction using a catalyst, absorption with oxidation or reduction, adsorption, and catalytic oxidation combined with chemical treatment. Similar NOx control methods are being developed for automobiles. The effects on NOx control method on the development of photochemical smog are mentioned. The use of exhaust gas recirculation in diesel engines, water injection, hybrid engines combining gasoline and diesel engines, and other automotive emission controls are reviewed.

30732 **APTIC NO. 53273**

Hatakeyama, Yoshihiro

DUST COLLECTOR WITH ROTARY GRINDER. *(Kaitenkenmaki o sonaeta shujinsochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 48-24793. 3p., July 24, 1973. (Appl. Aug. 24, 1970, 1 claim).*

A dust collector for a rotary grinder features compact design consisting of three separable units which are put together upon one another to save floor space. A grinder, the source of dust emission, is placed on the top of this dust collector. The three separable units are, from top to bottom, the air suction unit equipped with a fan, the filter unit with bag filters, and the dust retainer unit which is connected to the dust-collecting hood of the grinder by means of a flexible duct or hose. As the fan in the air suction unit is operated, air with dust produced by the grinding is taken into the dust retainer unit through the flexible duct and then sucked into the filter unit. Since the flow speed of the air drastically decreases when taken into the dust retainer unit, larger or heavier dust particles fall onto the bottom of the retainer unit. Fine dust particulates which did not fall are filtered by the bag filters provided in the filter unit. The air so cleaned is sucked into the air suction unit whose enclosure is provided with a number of vents or outlet holes through which the cleaned air is blown out. In another arrangement of this dust collector, the air suction unit may be lowermost and the filter unit above it.

30733 **APTIC NO. 52851**

Hayashi, Hiroshi

PRESENT SITUATION OF JAPANESE AUTOMOBILE ENGINE PROBLEMS AND THEIR FUTURE VIEW. *(Kokusan enjin no mondaiten to kongo no arikata). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(7):661-669, July 1973.*

Automobile emission standards for 1973 and thereafter are discussed. A public hearing will be held to discuss the technical developments in pollution control which will affect the 1975 and 1976 regulations. The Honda Compound Vortex Control Combustion engine (CVCC) should meet the 1976 Muskie law targets. The effects of various control methods on emissions of nitrogen oxides, hydrocarbons, and carbon monoxide are discussed.

30734 **APTIC NO. 53556**

Herbstman, Sheldon, Reese A. Peck, Frank E. Guptill, Jr., and Raymond F. Wilson

ASPHALT SEPARATION IN DESULFURIZATION WITH AN OXIDATION STEP. *(Texaco Inc., New York) U. S. Pat. 3,719,589. 5p., March 6, 1973. 7 refs. (Appl. March 5, 1971, 17 claims).*

A method for desulfurization of hydrocarbon materials of petroleum origin, particularly high molecular weight residue containing petroleum fractions, via an oxidation step is described. Oil containing sulfur and asphalt is subjected to oxidation with organic peroxides or organic peracids at 75-200 F. The oxidant residue is removed by heating the oxidized product to about 150-450 F, and the heated oil is maintained at 300-500 F to separate a lower asphalt layer from an upper oil layer having a reduced sulfur content. The separated oil layer may undergo further desulfurization by thermal treatment at 500-900 F or catalytic hydrotreatment at 650-900 F. A particularly preferred pressure range within which the hydrodesulfurization step provides extremely good sulfur removal while minimizing the amount of pressure and hydrogen required is anywhere from 300 to 800 psig. Particularly suitable catalysts comprise nickel and tungsten, cobalt and molybdenum, or nickel and molybdenum on a refractory support. (Author abstract modified)

30735 **APTIC NO. 53260**

Hirose, Hideo

MEASURES FOR DECREASING NITROGEN OXIDES WHICH MAKE USE OF VARIOUS BURNING TECHNIQUES. *(Nensho gijutsu ni yoru chisso sankabutsu teigen taisaku). Text in Japanese. Preprint, Research Group for Environmental Techniques, Osaka (Japan), p. 73-89, 1973. (Presented at the Seminar on Environmental Techniques, Osaka, Japan, May 16-17, 1973.)*

Mechanisms of nitrogen oxides formation are surveyed. The NOx production is enhanced when temperature is high, oxygen concentration is high, and the burning gas remains for a long time at the high temperature region. Fuels containing less nitrogen and lower oxygen concentration are desirable for decreasing NOx production. Two-step combustion, decreasing the temperature of the air, and other improved combustion methods can be used to reduce NOx emissions from power plant boilers.

30736 **APTIC NO. 52711**

Inaba, Hideya

DRY REMOVAL OF NOX IN COMBUSTION EMISSION. *(Nensho haigasu no chisso sankabutsu no kanshiki jokyo). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 2(6):411-415, June 1973.*

Dry removal techniques for the control of nitrogen oxides in fixed combustion sources are examined. The advantages and limitations of the BASF process using ammonia and a chemical process using hydrogen sulfide were reviewed. A nonselective catalytic decomposition process consisting of the reduction of sulfur dioxide and NOx by means of carbon monoxide over copper-aluminum catalysts was examined. A platinum-free catalyst was used; over the catalyst, excess CO reacted with water for complete conversion to carbon dioxide. Desulfurization was performed prior to NOx removal by adsorption by manganese oxide-iron oxide, and dust was removed in a moving layered dust collector.

30737 **APTIC NO. 52930**

Ishiguro, Tatsukichi

EXAMPLE OF COUNTERMEASURES AGAINST BAD ODORS AT A MEAT PROCESSING FACTORY. *(Kaseijo ni okeru akushu boshi taisaku-rei). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 9(6):561-571, June 1973. 1 ref.*

Meat processing factories are the largest source of bad odors, followed by pig and poultry farms. To control odors from meat processing facilities, the amount of collected raw material should be increased and freshness should be maintained. The hot air direct drying system should be avoided and the continuous or batching system should be adopted. A vacuum system is recommended for keeping odors from escaping. The design and arrangement of a plant should be comprehensive with emphasis on odor control. Scrubbing and absorption should be used together with combustion to remove bad odors. Trees should be planted around odor-producing factories.

30738 **APTIC NO. 53233**

Ishino, Norimoto

EXAMINATION OF SIMULTANEOUS REMOVAL OF SULFUR DIOXIDE AND NITROGEN OXIDES IN STACK GASES BY AMMONIA. *(Anmonia ni yoru endogasu chu no SO2 to NOx no dojijokyo ni kansuru kosatsu). Text in Japanese. Kankyo Sozo (Environ. Creation), 3(6):67-76, June 1973.*

An improved method of removing sulfur dioxide and nitrogen oxides simultaneously from stack gases by ammonia absorption is described. This method combines the activated manganese method for stack gas desulfurization with an ammonia regeneration circulation system, Shale s method of water addition, an air blowing system, and an ammonium sulfite aqueous solution. Ferric oxide is used as a catalyst in a fluidized bed. Elf s emulsion oil method is used to introduce water vapor into the stack gas.

30739 **APTIC NO. 52852**

Ishiyama, Koichi

WASHING TOWER FOR EXHAUST EMISSIONS USING FRP - ITS OPERATION AND MAINTENANCE. *(FRP o tsukatta haigasu senjo sochi - sono unten to hoshu). Text in Japanese. Kagaku Kojo (Chem. Factory), 17(7):82-86, July 1973, 7 refs.*

A gas washing tower was designed to remove sulfuric acid, hydrocyanic acid, hydrochloric acid, chromic acid, and fluorine emitted in the surface finishing process. The tower is made from fiber glass reinforced bisphenol type polyester (FRP), a strong, corrosion-resistant material. The tower is a liquid packed type. Inspection and maintenance are relatively simple, since the corrosion-resistant FRP requires no protective coating and since the packing material is made from rolled polyvinyl chloride film. The costs are less than normal. Cost of a washing tower for H2SO4 and H2CrO4 removal is a function of the flow rate. The absorption efficiency of H2CrO4 mist is a function of the liquid/gas ratio at the constant gas space velocity of 1.2-1.5 m/sec. An absorption efficiency of more than 95% occurred at 1.0 and 2.0 liquid/gas ratio. The washing tower is very effective in reducing chromic acid emission to less than the emission standard of 1 mg/N cu m.

30740 **APTIC NO. 53301**

Ito, Shigeru

DUSTER DEVICE IN GAS FILTER TYPE DUST COLLECTOR. *(Kitai roka shujinsochi ni okeru dasuto jokyosochi). Text in Japanese. (Yamamoto Kosakusho Co., Ltd., Kitakyushu (Japan)) Japan. Pat. Sho 48- 24773. 3p., July 24, 1973. (Appl. Dec. 24, 1970, 1 claim).*

A new dust removal system designed for a bag filter dust collector is described containing several bag filter units. It is designed so that air containing dust removed from the internal wall of a bag filter unit will not flow back into the main blower fan and so that any particular bag filter unit may be cleaned individually while other units are performing normal air or gas filtration. The main bag filter section contains several bag filter units, the auxiliary section has only one. Hoppers independent from each other are provided under the bag filters, one hopper per two bag filters in the main filter section and one per one in the auxiliary. The feeder pipeline from the source of dusty air or gas is equipped with the main blower fan and connected with each hopper unit through an individual feeder valve. Another pipe branched out from the feeder pipeline between the source of dusty air or gas and the main blower fan extends to the auxiliary filter unit equipped with a suction fan outside. This auxiliary pipeline is also connected with the bottom of each hopper via a rotary valve. Another branch pipeline is branched out from the auxiliary pipeline and communicated via counterflow valves with all the hopper units. For filtration the feeder valves are opened to feed air or gas into the bag filter/hopper units. As air or gas moves out of the filter units, it is filtered and cleaned. Dusty air or gas taken in through the auxiliary pipeline is filtered through the auxiliary filter unit. To clean any particular bag filter, the feeder valve is closed while the counterflow valve and the rotary valve are opened. This makes air or gas inside of the bag filter/hopper unit be sucked by the suction fan, so that air flows into the unit from outside to remove dust accumulated on the internal wall. The dust removed from the internal wall as well as that deposited in the hopper is carried through the auxiliary pipeline and filtered by the auxiliary filter unit before being discharged.

30741 **APTIC NO. 52838**

Iversen, R. E.

AIR POLLUTION IN THE ALUMINUM INDUSTRY. *J. Metals, 25(1):19-23, Jan. 1973. 3 refs.*

Gaseous and particulate fluorides are the most serious pollutants from aluminum electrolytic reduction plants. The greatest source of pollutants of all types is normally at the individual cells or potlines, followed by the anode bake plant. In 1970 controlled emission prebaked potlines released 51% of the industry s total fluoride emissions. The greater portion of these prebake potlines employed only primary control systems (i.e., floating beds, spray towers, impingement baffles, cyclonic towers, packed towers, bubble towers, and venturi scrubbers preceded by mechanical collectors, multicyclones, or dry electrostatic precipitators for particulate removal). Control efficiency was 78% of cell emissions. Control efficiency of 85% was obtained for prebake lines employing both primary and secondary (i.e., spray screens and packed beds) systems. For vertical stud Soderberg cell production, overall fluoride collection efficiency was 78% for lines using primary collection only and 95% for lines using both primary and secondary control. All horizontal stud Soderberg production occurred on lines with primary collection only; overall collection efficiency was 70%. The use of primary and secondary control systems can reduce prebake plant emissions to 1.60 lb fluorides and 5.0 lb particulates/ton of aluminum; vertical stud Soderberg emissions to 2.8 lb fluorides and 9.1 lb particulates; and horizontal stud Soderberg emissions to 3.60 lb fluorides and 12.30 lb particulates. The estimated capital investment for installed controls on potlines is $240 million; operating costs are about $65 million/yr.

30742 **APTIC NO. 52710**

Kageyama, Osamu, Kunio Koga, Kiyoshi Kameda, Yoshio Kijima, and Masao Nakagawa

GAS ADSORPTION CHARACTERISTICS OF PLASTIC PACKING MATERIAL (NET RING). *(Purasuchikku jutenbutsu niyoru gasu kyushu to sono seino). Text in Japanese. Kagaku Kojo (Chem. Factory), 17(7):77-81, July 1973. 5 refs.*

The gas adsorption characteristics of net ring, a new plastic packing material for packed towers, were studied. The gas adsorption capacity was influenced by various parameters, including liquid and gas flow rate, their physical properties, temperature, the diffusion coefficients of gas to liquid and liquid to gas, the structure of the packing column, and packing height. The column was constructed of hard polyvinyl chloride with a packing height of 1 m. An ammonia-air-water system was used for testing at a constant inlet gas concentration of 10,000 ppm. The overall material transport coefficient varied widely with gas flow rate and structure.

30743 **APTIC NO. 52929**

Kato, Seitaro

PRACTICES OF BAD ODOR COUNTERMEASURES AT CHEMICAL FACTORIES. *(Kagaku kojo deno akushu taisaku no jissai). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 9(6):553-560, June 1973. 12 refs.*

Chemical factories use absorption, adsorption, ozone and air oxidation, masking, and neutralization to remove bad odors. The absorption and removal of amines by acid washing and the neutralization and removal of mercaptan, hydrogen sulfide, and organic acids by alkali washing are two examples of the neutralization method. For the oxidative reaction, absorption solutions containing a hypochlorite, chlorine, chlorine dioxide, and permanganate are used to remove odors from meat processing or asphalt works. Absorption methods are effective provided the causative components for bad odors are contained in finely granular form. The ozone oxidation method is used mainly for organic waste odor treatment.

30744 **APTIC NO. 53276**

Kato, Seitaro

DEODORIZING PROCESS BY CHEMICAL ABSORPTION, AND ITS PROBLEMS. *(Yakuekikyushu ni yoru dasshuho to sono mondaiten). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 3(11):25-40, May 1973.*

Neutralization of odors includes scrubbing with an acidic solution for absorption of amines and scrubbing with an alkaline solution for removal of mercaptan, hydrogen sulfide, organic acids, and other acidic gases. Oxidation reactions can also be used to remove odors; they include oxidation with absorbent solutions such as chlorine compounds and potassium permanganate for removal of odors from asphalt or bone/intestine processing plants. Types of scrubbers, the reaction of H2S with sodium hydroxide, the relationship of sulfur and sulfate produced by oxidation reaction when H2S is oxidized with hypochlorous acid, absorption efficiency of various H2S absorbents, and H2S recovery methods are also discussed.

30745 **APTIC NO. 53261**

Kitagawa, Hiroshi

ACTIVATED CARBON. *(Kassei tan). Text in Japanese. Kagaku Kojo (Chem. Factory), 17(8):17-22, Aug. 1973. 22 refs.*

Uses, production method, and properties of activated carbon are mentioned. Granular carbon is used in gas adsorption, purification of water and sewage, and as a catalyst carrier of vinyl resins. Chemical and gas activation methods are used to produce activated carbon from raw materials such as saw dust, coconut shells, coal, peat, oil cokes, and cellulose. Activated carbon properties are influenced by raw material, carbonizing temperature, activation temperature and time, and kind of activator. Surface compounds containing oxygen and sulfur also affect the adsorption ability and the catalyst carrier ability. The adsorption efficiency of activated carbon can be judged by iodine adsorption ability (deodorizing ability), the molasses test (decoloring ability), or the permanganate test (decoloring ability of colored colloid). The adsorption equilibrium, adsorption rate, and strength are important judgement factors for granular carbon. The use of activated carbon for air and water purification is mentioned.

30746 **APTIC NO. 52920**

Kitagawa, Mutsuo and Katsumi Hayashi

PRODUCTION PROCESSES OF ACTIVATED CARBON AND REQUIRED PROPERTIES. *(Kasseitan no seizo purosesu to shitsuyo seijo). Text in Japanese. Petorokemikaru Enjiniaringu (Petrochem. Eng.), 5(7):19-26, July 1973. 9 refs.*

Processes for producing activated carbon are discussed including gas activation, chemical activation of particle activated carbon, and chemical activation of powdery activated carbon. Spherical activated carbon can be produced by a special process. The process and its costs are described. Various methods of reactivation of used activated carbon are surveyed.

30747 **APTIC NO. 52713**

Komami, Yoshihisa

MAINTENANCE OF DUST COLLECTORS FOR BOILERS. *(Boira no baien shujin sochi no hoshu kanri). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 40(7):668-672, July 1973. 8 refs.*

The maintenance of multicyclone dust collectors was examined using operating data on dust collection efficiency in boilers. In a multicyclone dust collector, the dust is separated and collected by means of centrifugal force. The dust is dispersed into unit cyclones and separated by the rotation of the cyclone blades. Dust can therefore accumulate around the blades and the cyclone cone. With no maintenance or regular cleaning, dust collection efficiency is reduced to 60% of original efficiency within two years. Regular inspection and maintenance, therefore, are necessary for high efficiency.

30748 **APTIC NO. 53506**

Kosobe, Hironori and Tsuneo Sugitani

FUEL OIL GASIFICATION AND DESULFURIZATION. *(Juyu no gasuka datsuryu). Text in Japanese. Ishikawajima-Harima Giho (Ishikawajima-Harima Tech. Rev.), 1973:44-50, May 1973.*

The Texaco gasification process and Flexicoker process are outlined as alternatives to the conventional fuel oil desulfurization process. The Texaco gasification process, which has been widely used for providing synthetic gas or hydrogen for chemical and petroleum industries, is combined with a solvent deasphalting unit and produces low sulfur fuel gas from the asphalt. The Flexiocoker is a developed form of the conventional fluid coker. This process produces not only a low sulfur fuel gas, but a considerable amount of low sulfur liquid fuels that are handled, stored, and transferred more easily than gaseous fuels.

30749 **APTIC NO. 53054**

Krishnan, N. G. and R. W. Bartlett

KINETICS OF SULFATION OF ALKALIZED ALUMINA (NA2O AL2O3). *Atmos. Environ., 7(5):575-586, May 1973. 8 refs.*

A thermogravimetric analysis was made of the sulfation of alkalized alumina between 300 and 600 C, using sulfur dioxide concentrations typical of stack gases, 0.001-0.025 atm. Both dry gases and gas mixtures containing up to 0.024 atm water vapor were used. The primary reaction product was sodium sulfate (I), but at 500 C and above, sodium aluminum sulfate formed a the later stages of the sulfation. The rate of formation of sodium sulfate was proportional to the sulfur dioxide concentration, independent of oxygen partial pressure, and proportional to the untreated NA2O in alkalized alumina. The rate of sulfation appeared to be controlled by formation of sodium sulfite which was subsequently oxidized to the sulfate. The experimental activation energy for the formation of sodium sulfate was low. In the absence of small amounts of water vapor a marked decrease in the rate occurred. (Author abstract)

30750 **APTIC NO. 52821**

Leith, David and Dilip Mehta

CYCLONE PERFORMANCE AND DESIGN. *Atmos. Environ., 7(5):527-549, May 1973. 21 refs.*

Several frequently used methods for predicting cyclone pressure drop and efficiency are reviewed. This study is limited to cyclones of the cone-under-cylinder layout with tangential gas inlet. Five pressure drop theories and four efficiency theories are evaluated against experimental data taken from the literature. One pressure drop and one efficiency theory are judged best and used with an optimization procedure to develop a cyclone design method. This design method gives a means of calculating the dimensions of a theoretically optimum cyclone for any set of design criteria. A cyclone designed by this procedure is compared with a standard high efficiency cyclone, and is found theoretically to have better efficiency under identical operating conditions. (Author abstract modified)

30751 **APTIC NO. 52951**

Lodi, G., M. Gaggero, A. Reverberi, and M. Chiarioni

INDUSTRIAL GAS SCRUBBING PLANTS. SECOND COMMUNICATION. THE FLUID DYNAMICS OF PACKED COLUMNS. *(Impianti per il lavaggio di gas industriali. Nota II. Osservazioni sul regime fluodinamico in colonne riempite). Text in Italian. Riv. Combust. (Milan), 27(3):102-106, March 1973. 7 refs. (Presented at the Congresso Nazionale di Chimica, 11th, Perugia, Italy, Oct. 19-21, 1972.)*

In the abatement of gaseous pollutants in scrubbers, the surface characteristics of scrubbing tower packing materials play a major role. The question was examined experimentally by a pilot absorption column 2 m high and 220 mm in diameter, a ventilator with an output of 200 N cu m/hr, and appropriate measurement instruments. The packing materials examined were Pall rings and Intalox discs both made of ceramic and of polyvinyl chloride (PVC) or a total of four different charges. For these charges the hold-up value was determined for various throughputs of water and air; hold-up was defined as the quantity of water retained indefinitely by the charge under static conditions plus the quantity of water which drained from the column following sudden stoppage of water inflow. The gas flow was measured by differential manometers. Results disclosed that in all cases hold-up was lower for PVC than for ceramic charges of the column. A charge consisting of PVC elements increases the quantity of gas the column can handle without flooding in comparison with a charge made up of ceramic elements. This holds under conditions when gas film limitation does not intervene.

30752 **APTIC NO. 52888**

Lotz, Helmut and Hans-Hermann v. Strantz

THE MODERNIZATION AND EXPANSION OF THE ESSO REFINERY AT HAMBURG. *(Die Modernisierung und Erweiterung der Esso-Raffinerie Hamburg). Text in German. Erdoel Kohle (Hamburg), 26(7):388-393, July 1973.*

The expansion of a refinery to a crude capacity of 110 MB/CD is described. The investments for environmental protection are mentioned. Processes are controlled with a computer. For avoidance of any environmental pollution of the neighborhood a 165-meter stack has been erected. A new flare with a height of 110 m ensures that the combustion of the residual gas quantity takes place in an altitude where the flue gases mix immediately with sufficient air and are diluted. For reduction of the sulfur dioxide emission, all smaller furnaces are designed for the use of low-sulfur fuel only. For the waste gases from bitumen oxidation and bitumen tanks, an afterburner has been installed.

30753 **APTIC NO. 52879**

MacAskill, D.

FLUID BED ROASTING: A POSSIBLE CURE FOR COPPER SMELTER EMISSIONS. *Eng. Mining J., 174(7):82-86, July 1973. 5 refs.*

The pollution problems of copper smelters are discussed from the standpoint of maximum desulfurization of the feed prior to smelting, i.e., an attack on sulfur at the source rather than trying to capture it after it has entered the smelter. Fluid bed roasting is suggested for the desulfurization. Fluid bed roasting is a valuable addition to smelter technology and has emerged from a protracted developmental period. Dust collection problems have been largely overcome, and the technique offers considerable promise. The present round of sulfuric acid plant additions to smelters, based on recovery of sulfur from converter gases, offers a relatively simple approach to smelter sulfur emissions.

30754 **APTIC NO. 52683**

Machida, Minoru

SOME OBSERVATIONS ON OFFENSIVE ODOR CONTROL MEASURES FOR KRAFT PLANTS. *(Kurafuto kojo akushutaisaku ni kansuru nisan no kosatsu). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(3):357-361, July 1973.*

Kraft pulping causes odors including methyl mercaptan, methyl sulfide, and hydrogen sulfide. Emission standards for these pollutants are now 0.002-0.01 ppm, 0.01-0.2 ppm, and 0.02-0.2 ppm, respectively. The kraft cooking oven produces these odors which are retained in the waste cooking liquor (black liquor) or released with the steam during blowing and relief. Different odors are produced by the black liquor depending on its treatment. The best odor control measure is a closed process with complete sulfur recovery. Sulfur should be recovered from both gases released into the atmosphere and odors dissolved in the black liquor. Deodorization methods include scrubbing (absorption), black liquor oxidation, incineration, and adsorption. The specific control methods are discussed according to their use in areas such as the cooking oven, vacuum evaporator, and recovery boiler.

30755 **APTIC NO. 53548**

Maeda, Isamu

CONTINUOUS MOVING LAYER TYPE ADSORPTION DEVICE. *(Sumitomo Jukikai Kogyo Kabushiki Kaisha, Tokyo (Japan.)) U. S. Pat. 3,716,969. 7p., Feb. 20, 1973. 2 refs. (Appl. Dec. 10, 1971, 10 claims).*

A continuous layer adsorption device which can be used in an exhaust gas desulfurization system is presented. The device is made of an adsorption vessel filled with activated charcoal and a rectifying device within the vessels. The device comprises a side wall provided with a number of louvers located at the gas-introducing side of the device, another side wall having delivery holes located at the gas-exhausting side of the device, a hopper-like portion provided adjacently below the two side walls, and an elongated port provided at the bottom of the hopper portion for delivering the activated charcoal. The rectifying devices are composed of a rectifying body placed in the hopper portion and a rectifying place extended downward from the main body of the device. The device has continuously moving layers of charcoal in which the charcoal can be replaced at any time. Designs of the device are provided.

30756 **APTIC NO. 53559**

Meacham, George B. and William S. Nagel

EMISSIONS CONTROL SYSTEM. *(Eaton Yale and Towne Inc., Cleveland, Ohio) U. S. Pat. 3,714,932. 13p., Feb. 6, 1973. 6 refs. (Appl. Aug. 19, 1971, 14 claims).*

A method, system, and apparatus for minimizing the amounts of undesirable pollutants emitted from an internal combustion engine after combustion have been accomplished by controlling the timing of the intake and exhaust valves of the cylinders of the engine. That portion of the products of combustion of a given operating cycle which contains the highest proportion of noxious constituents is retained in the cylinder and is mixed with the incoming charge for the next operating cycle. One particular form of the invention comprises varying the proportion of such retained products according to engine operating conditions in order to maintain the dilution of the incoming charge at the maximum level consistent with good engine performance. The retained products are in an amount in excess of that normally retained in the cylinder clearance volume at the exhaust manifold pressure. (Author abstract modified)

30757 **APTIC NO. 53057**

Mezhuyev, M. I., V. S. Gorshkov, and A. Ya. Khesina

A CONTRIBUTION ON THE APPLICATION OF A CATALYTIC AFTERBURNING METHOD FOR THE REMOVAL OF 3,4-BENZOPYRENE FROM INDUSTRIAL FLUE GASES. *(K ispol zovaniyu kataliticheskogo metoda dozhiganiya dlya ochistki promyshlennykh gazov ot 3,4-benzipirena). Text in Russian. Gigiena i Sanit., no. 6:102-104, 1973. 1 ref.*

The efficiency of the catalytic afterburning of asphalt manufacturing-generated waste gases in the presence of bauxite as catalyst for the removal of 3,4-benzopyrene was studied. The flue gases were admitted into a tubular furnace with quartz tubes filled with bauxite which were heated to 200-600 C by means of nickel-chromium spirals. The gases, passing through the catalyst layer, were oxidized to carbon dioxide and water. The purification efficiency rose from 87% at 400 C to 93-97% at 600 C regarding organic aerosols. The 3,4-benzopyrene concentration decreased from an average initial value of 0.025 micrograms/l to 0.0014 micrograms/l after afterburning. The efficiency of the 3,4-benzopyrene destruction was highest with 94% at 600 C temperature.

30758 **APTIC NO. 52893**

Mishima, Hideo, Shozo Yano, Kanau Takeuchi, and Koichi Iinoya

SHIMADZU MICRO CYCLONE. *(Chokogata saikuron). Text in Japanese. Shimazu Hyoron (Shimazu Rev.), 30(1):81-85, March 1973. 9 refs.*

A performance test for a newly-developed Micro Cyclone (25 mm I.D.) using JIS-8 sample powder proved the instrument's capacity for collecting particulates smaller than 1 micron at the rate of 98% or more. The design criteria, measurement of collection efficiency, pressure loss, the effect of blowdown, and various applications of Micro Cyclone are discussed. When the flow rate at the entrance is 20 m/sec, the collection rate is about 98.48%; but there are some fluctuations. The particle diameter reading at 98% collection rate is 0.7 micron; therefore, the dust particles larger than 1 micron cannot be collected. The collection quantity is small (about 70 l/min), but the combination of these cyclones into a multi-cyclone form will make it available for various uses.

30759 **APTIC NO. 53438**

Mitchell, H. R. and R. N. McGill

AUTOMOTIVE POWERPLANT TRANSDUCERS - FACT OR FICTION? Preprint, Society of Automotive Engineers, Inc., New York, 5p., 1973. 5 refs. (Presented at the Society of Automotive Engineers, Automobile Engineering Meeting, Detroit, Mich., May 14-18, 1973, Paper 730573.)

There are several major areas associated with automotive powerplants which are expected to be likely candidates for control by electronic systems. These areas include such functions as fuel and air metering, spark timing, and exhaust gas recirculation. The systems controlling these functions will be developed to reduce exhaust emissions and will probably require transducers of various types. Among the transducer types which may be required are: absolute, gage, and differential pressure transducers; temperature sensors; position sensors; humidity sensors; specific gas sensors; and fluid flow sensors. The specifications for transducers to be used in association with automotive control systems are stringent. They must offer at least + or 1% accuracy, long term stability, and high order dynamic performance. They will be required to perform at extremes of temperature in a dirty environment and will usually be subjected to vibration. They must also be reasonably inexpensive and, while most commercial transducers are now of analog type, digital output transducers may be preferable to the analog variety. For many applications in automotive control systems, adequate transducers are not yet available and considerable developmental work is still needed. There must be improved two way communication between automotive engineers and transducer manufacturers if the latter are to complement the work of the former and create truly practical electronic control systems for application on future automotive powerplants.

30760 **APTIC NO. 53560**

Nakada, Masahiko and Hirofumi Matsumoto

EXHAUST GAS PURIFYING DEVICE. *(Toyota Jidosha Kogyo Kabushiki Kaisha, Aichi-ken (Japan)) U. S. Pat. 3,707,954. 7p., Jan. 2, 1973. 3 refs. (Appl. June 17, 1971, 3 claims).*

An exhaust gas purifying device which is simultaneously effective in reducing the levels of carbon monoxide, hydrocarbons, and nitrogen oxides and reducing fuel consumption without decreasing maximum output power provides for reduction of the richness of the air-fuel mixture ratio by supplying an optimum amount of secondary air to the intake manifold which is commensurate with the operating condition during idling or partial load after warm-up and by reducing the vacuum advance when the engine is operating under partial load after its warm-up period. The apparatus consists of a thermo-valve which responds to the degree to which the engine is warmed up, a flow rate regulating valve which regulates the flow rate of secondary air supplied to the intake manifold in accordance with the operating condition of the engine, two orifices located in a branch passage between the two valves, a first connecting line mounted between the portion of the branch passage which is disposed posterior to the first orifice and a diaphragm chamber of the vacuum advancer for maintaining communication therebetween, and a second connecting line mounted between the portion of the branch passage which is disposed posterior to the second orifice and a vacuum port of the carburetor for maintaining communication between the two. (Author abstract modified)

30761 **APTIC NO. 53499**

Nakahira, Tetsuya

LARGE SCALE EQUIPMENT USING THE IHI-CHEMICO PROCESS FOR REMOVING SULPHUR DIOXIDE FROM STACK GAS. *(IHI-CHEMICO-ho ni yoru ogata haien datsuryu sochi no gaiyo). Text in Japanese. Ishikawajima- Harima Giho (Ishikawajima-Harima Tech. Rev.), 1973:51-54, May 1973.*

Large scale equipment for removing sulfur dioxide from stack gas is described. An outline of a slurry process using magnesium oxide in an absorber is presented, together with the characteristic features of the various stages in the process including absorption, centrifugal separation, drying, calcination, and hydration. The characteristic features of the limestone method which was developed as a combination of the Chemical Construction Corp. venturi scrubber, and the accumulated technology concerned with IHI gypsum recovery process are described.

30762 **APTIC NO. 52923**

Ninomiya, Nobutaka

PRESENT STATUS OF THE ACTIVATED CARBON INDUSTRY AND FUTURE MOVEMENT. *(Kasseitan kogyo no genjo to kongo no doko). Text in Japanese. Petorokemikaru Enginiaringu (Petrochem. Eng.), 5(7):10-18, July 1973. 9 refs*

Activated carbon production methods are discussed. Because of reactivation methods, crushed activated carbon is replacing powdered activated carbon. Due to increased use of activated carbon in pollution control, demand for activated carbon has increased; the demand for particle activated carbon in 1972 was about 10 times as large as that in 1968. Costs, imports, markets, and supply are mentioned.

30763 **APTIC NO. 53498**

Oguri, Haruo

IHI-TCA SO2 REMOVAL PLANTS USING SODIUM AND CALCIUM SYSTEMS. *(IHI-TCA haien datsuryu sochi no gaiyo -- Tatoriumuho oyobi karushiumuho). Text in Japanese. Ishikawajima-Harima Giho (Ishikawajima-Harima Tech. Rev.), 1973:55-60, May 1973.*

The marketing of the IHI-Turbulent Contact Absorber (TCA) sulfur dioxide removal plants as facilities to prevent pollution is described. The IHI-TCA-SO2 plants are effectively removing SO2 in various industries. The plants use the sodium sulfate disposal system and have capacities of 10,000 to 100,000 N cu m/hr. About 10 plants are currently in operation. A plant for large size boilers using the Na2SO3 by-product system and having the capacity of 480,000 N cu m/hr is under construction for Mitsui Semboku Petrochemicals, Inc. Another unit for a diesel plant, which uses the gypsum byproduct system and has the capacity of 100,000 N cu m/hr was delivered to the Chichibu Cement Co., Ltd.

30764 **APTIC NO. 53500**

Okumura, Eijiro, Toshio Tsugane, and Katsuhiko Matsuo

STUDY OF INSTALLATION FOR THE OXIDATION IN WET-METHOD DESULFURIZING PLANT FOR FLUE GAS. *(Haien datsuryu puranto ni okeru sanka sochi no kenkyu). Text in Japanese. Ishikawajima- Harima Giho (Ishikawajima-Harima Eng. Rev.), 1973:20-30, May 1973. 2 refs.*

An installation for the oxidation in a wet method desulfurizing plant for flue gas is described. Among the by-products generated, sodium sulfite is prone to be in excess due to unbalanced supply and demand. It will either be utilized as Glauber s salt (sodium sulfate) or discarded. In processing this surplus by-product, air (oxygen) is supplied to the solution and an installation for the oxidation is required to effect the following oxidizing reaction sufficiently: Na2SO3 + 1/2 O2 yields Na2SO4. Providing a plate of porous sintered metal (mean diameter of aperature: 120 micron) to this installation, or the oxidization tower, a miniature experiment (dimensions of tower: 280 mm phi times 4000 mm H, two towered flowing system, open air type) was conducted. The basic data obtained show better performance than in the previous case. The installation was standardized for scaling up to a commercial plant.

30765 **APTIC NO. 53171**

Ozaki, Kunpei, Yoshiaki Kajitani, Hideo Fukuhara, and Masanobu Nakamura

ENVIRONMENT POLLUTION CONTROL SYSTEM OF COKE WORKS. *(Kokusu kojo no datsujin, datsuryu shisutemu). Text in Japanese. Kawasaki Giho (Kawasaki Tech. Rev.), 1973:126-131, April 1973.*

An environmental pollution control system for coke works is described which eliminates the following contaminating substances: dust from coke oven and incidental equipment, harmful effluents from the coke oven by-product plant, and harmful components of coke oven gases emitted into the atmosphere. The control system accomplishes the above by a combination of the following new processes: a pipe charging system of preheated coal to coke ovens, a rotary quencher combined with coke oven equipment, and a sulfiban process in the desulfurization plant.

30766 **APTIC NO. 52856**

Poltorak, Raymond L.

FOUNDRY ODOR CONTROL WITH ACTIVATED CARBON. *Mod. Casting, p. 44-45, Aug. 1973. 5 refs.*

The use of activated carbon to control odors in foundries is discussed. Adsorption with activated carbon is described, and the most common organic vapors producing odors are reviewed. The design and selection of equipment for foundry odor control systems are considered. The regeneration of carbon for re-use is discussed as an economical advantage of control systems.

30767 **APTIC NO. 53504**

Priest, John D.

EXHAUST DEPURATOR. *(Assignee not given.) U. S. Pat. 3,712,030. 4p., Jan. 23, 1973. 11 refs. (Appl. Sept. 14, 1970, 2 claims).*

A muffler-like device for purifying the exhaust gases of an internal combustion engine is described which differs from other such devices in its substantially conventional construction which can be filled with a readily available filtering material, thus rendering the device relatively inexpensive in operation. A cylindrical shell or jacket is provided with coaxial diametrically reduced end connection portions forming inlet and exhaust openings to be interposed in a combustion engine exhaust line. A coaxial tube, within the jacket, has its forward end slidably received by the inlet end of the jacket for longitudinal sliding movement. The major portion of the tube is provided with a foraminated double will which is coaxially surrounded by a sleeve fixed within the jacket and similarly having a foraminated double wall. The sleeve has a circular crosssection area greater than the tube and less than the jacket, and its overall length is less than the jacket. An exhaust gas bypass or passageway is thus formed at the forward limit of the sleeve to relieve exhaust back pressure. The spacing between the double walls of the tube and sleeve are filled with a granulated filtering material such as lithium hydroxide or charcoal.

30768 **APTIC NO. 53546**

Reinauer, Thomas V.

METHOD OF FILTERING. *(Assignee not given.) U. S. Pat. 3,716,971. 10p., Feb. 20, 1973. 12 refs. (Appl. March 29, 1971, 9 claims).*

A filtering method of affecting separation of particulate matter from a gaseous carrier is presented. The passage of the gas stream is subdivided through a plurality of discrete filter chambers disposed in vertical superposed relation, and interconnected by a vertically oriented conduit member. The conduit is composed of in part by a permeable filter medium that forms a portion of the defining walls of each such chamber. An improved cleaning method is included wherein the filter media associated with each discrete and vertically superposed filter chamber is subjected to cleaning in predetermined sequence that is directionally concurrent to the direction of particulate matter displacement toward a receiving hopper. The lower portions of the filter media are preferentially subjected to an effectively greater quanta of cleaning than the upper portions. The method improves the operation of vertically oriented dust collectors. Designs of the filter are given.

30769 **APTIC NO. 52701**

Riemann, Udo and Fred-Heinrich Jensen

A NEW UNIT FOR AEROBIC MANURE TREATMENT. *(Ein neues Geraet zur aeroben Dungbehandlung). Text in German. Landtechnik, 28(11/12):319-320, 1973.*

Methods for treatment of manure for the purpose of reducing the odors and the germ concentration have even greater importance than methods of manure disposal. In an experimental plant for aerobic biological liquid manure treatment, a new aerator was used. The aerator consists mainly of a shaft which is driven by an electric motor. At the other end, a fly wheel is installed. The shaft rests in a tube which widens on top for the inlet. The unit is placed vertically into the fluid. The fly wheel rotating with 1440 rpm accelerates the liquid in a radial direction and produces an underpressure which draws air and foam. The air/foam mixture enters the basin through the fly wheel opening and mixes with manure. The manure/air mixture flows in radial direction from the aerator to the basin wall. Trial runs with this aerator revealed that apart from a slight compost and ammonia odor which was discernible only in the immediate vicinity, no odors could be smelled. The temperature rises to 60 C.

30770 **APTIC NO. 53561**

Riley, Kenneth L. and John D. Shoemaker, Jr.

WATER INJECTION IN A HYDRODESULFURIZATION PROCESS. *(Assignee not given.) U. S. Pat. 3,720,602. 5p., March 13, 1973. (19 claims).*

A method for catalytic hydrodesulfurization of substantially non-metal-containing, sulfur-bearing hydrocarbon feedstocks such as vacuum gas oils, virgin gas oils, thermal or catalytic cycle oils, and the like has been developed. The process comprises admixing a substantially non-metal containing, heteroatom-bearing hydrocarbon feed with hydrogen and contacting the admixture with a catalyst consisting of compounds of the metals of Group VI B and/or Group VIII of the Periodic Table and from about 0.1 to 15% by weight of a Group V B metal. Employing the catalyst system of the present method in combination with water injection improves catalyst activity when hydrorefining substantially non-metals containing sulfur-bearing hydrocarbon feeds. The term substantially non-metal containing as employed in reference to the hydrocarbon feedstream defines a feedstream containing less than about 25 ppm of organometallic compounds, especially organometallic compounds of metals from Group V B of the Periodic Table.

30771 **APTIC NO. 53437**

Rochelle, Gary T.

A CRITICAL EVALUATION OF PROCESSES FOR THE REMOVAL OF SO2 FROM POWER PLANT STACK GAS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa. 29p., March 1973. 4 refs. (For presentation at the Air Pollution Control Association, Annual Meeting, 66th, June 24-28, 1973.)*

With regard to techniques the removal of sulfur dioxide from power plant stack gas, lime slurring scrubbing and the Wellman Lord process are probably the most ready for widespread commercial application. Limestone slurry scrubbing, magnesium oxide scrubbing, and catalytic oxidation present unresolved problems, while techniques such as the double alkali, Chiyoda, Strong and Webster/Ionics, and citrate processes appear to be less developed but potentially applicable. The costs of stack gas cleaning are a stronger function of source conditions than of process type. Annualized costs would typically run from 1.5 to 3 mills/kwh, with the dry processes probably costing more than wet scrubbing. Regenerable processes are favored at high waste disposal costs and throwaway processes are favored at low waste disposal costs. Almost all of the processes are capable of 90 to 95% sulfur dioxide removal, but the sodium alkali systems (e.g., the Stone and Webster/Ionics process) have potential for 95 to 99% removal, which may be necessary for future air pollution abatement. The primary differences in environmental impact occur in the quality and quantity of liquid and solid wastes produced by the processes. The cleanest process is magnesium oxide scrubbing, while the throwaway processes have the greatest potential for environmental degradation. Even if sulfur from regenerable processes cannot be marketed, it poses a less severe waste disposal problem than calcium sludge. Reasonably waste free flue gas cleaning processes are or will soon be available at annualized costs of 15 to 30 cents/MMBTU. (Author abstract modified)

30772 **APTIC NO. 53513**

Rodely, Alan E. and Theodore J. Fussell

BLUFF BODY FLOWMETER ARRANGEMENT FOR USE IN CONTROLLING AIR POLLUTION PRODUCED BY INTERNAL COMBUSTION ENGINES. *(Eastech, Inc., South Plainfield, N. J.) U. S. Pat. 3,722,275. 5p., March 27, 1973. 7 refs. (Appl. Nov. 4, 1971, 13 claims).*

A bluff body flowmeter arrangement is described for use in controlling air pollution produced by internal combustion engines. The arrangement, which is used to monitor the air intake of the combustion engine, comprises, in combination, a conduit having an optional entrance portion of a relatively large uniform cross-section, an exit portion of a relatively smaller uniform cross-section coupled to the engine air intake and a transition portion having a tapered cross-section connecting the entrance and exit portions; a bluff body disposed in the exit portion transverse to the air flow; and damping means covering the inlet of the entrance portion for preventing drafts and cross-winds from disturbing the velocity profile of air flow in the conduit sufficiently to interfere with regular vortex shedding by the bluff body. Also described is an embodiment in which the entrance portion of the conduit is omitted, in which case the damping means covers the inlet of the transition portion through which air enters and passes to a bluff body located in the exit portion. (Author abstract)

30773 **APTIC NO. 52703**

Rosenbaum, J. B., W. A. McKinney, H. R. Beard, Laird Crocker, and W. I. Nissen

SULFUR DIOXIDE EMISSION CONTROL BY HYDROGEN SULFIDE REACTION IN AQUEOUS SOLUTION. *Bureau of Mines Report of Investigations, 31p., 1973. 14 refs.*

Prolonged laboratory and limited pilot plant tests have shown that the Bureau of Mines buffered sulfur dioxide-hydrogen sulfide process is capable of removing 95 to 99% of the SO2 from industrial waste gases. Most of the SO2 is converted to elemental sulfur; only about 1 percent converted to sulfate. The process comprises washing the flue gas to remove particulates and SO3, absorption of the SO2 in citric acid or other carboxylate solution, reaction of the loaded solution with H2S in a closed vessel to precipitate the absorbed SO2 as elemental sulfur, and separation of the sulfur from the regenerated solution by oil flotation and melting. Two-thirds of the molten sulfur is converted to H2S for use in the sulfur precipitation step by reacting sulfur vapor with natural gas and steam in the presence of an alumina catalyst. The chemistry and mechanism of the process are described, initial laboratory and pilot plant data are summarized, and second-generation laboratory operation and pilot plant design are reviewed. Preliminary cost estimates are presented for recovering sulfur from copper smelter gas, powerplant flue gas, and Claus plant tail gas. (Author abstract)

30774 **APTIC NO. 53510**

Ruth, Arthur P.

INTERNAL COMBUSTION ENGINE INCORPORATING MODIFICATION TO REDUCE POLLUTION IN EXHAUST THEREFROM. *(Assignee not given.) U. S. Pat. 3,712,281. Jan. 23, 1973. 6 refs. (Appl. March 23, 1971, 14 claims).*

A vehicular pollution reducing system has been developed whereby exhaust gases from an internal combustion engine are captured and at least partially recirculated to decrease the percentage of pollutants passed by the engine to the atmosphere. The exhaust stream from the exhaust manifold is returned for recycling through the carburetor, subject to the control of a valve means; and, depending upon the loading of the engine, a variable supply of oxygen is interjected at the carburetor to enhance the extent of combustion and thereby reduce the noncombusted hydrocarbon gases. Recirculation is further accompanied by the injection of steam at the carburetor to slightly cool the gases drawn into the engine, hence, increasing the compression and tending to improve the extent of combustion within the engine. (Author abstract modified)

30775 **APTIC NO. 53515**

Sackett, Walter J., Sr.

FOG IMPINGEMENT SCRUBBING SYSTEM. *(A. J. Sackett and Sons Co., Baltimore, Md.) U. S. Pat. 3,713,277. 5p., Jan. 30, 1973. 10 refs. (Appl. Jan. 15, 1971, 4 claims).*

A fog impingement scrubber system is provided for removing particulate matter, such as product dust and combustion dust products, as well as fumes, and water soluble or water reactant vapors generated during a manufacturing process. The polluted air stream from the manufacturing process is fed to a fog impingement scrubber system. The polluted air stream is first sprayed by a series of high pressure water sprays to create a fog or mist to dampen or wet particulate matter in the air stream, particularly any fine or microscopic sized particles. A second set of water nozzles or sprays is then utilized further downstream of the fogging area to moisten the larger particles of particulate matter in the air stream. The sprayed polluted air stream is then impinged upon a whirlpool provided in the scrubbing system, where the moistened particles are removed from the air stream, and where the water soluble or water reactant vapors are treated. Any moisture in the air is then removed by a demisting system, and the clean air then discharged back to the atmosphere. (Author abstract)

30776 **APTIC NO. 53509**

Sailers, Young T.

APPARATUS FOR SMOKE CONTROL. *(Assignee not given.) U. S. Pat. 3,712,041. 5p., Jan. 23, 1973. 4 refs. (Appl. Jan. 29, 1971, 4 claims).*

A fog generating apparatus for control of smoke from exhaust stacks has been developed which is simple in construction, economical to manufacture, and reliable in operation as compared to previous attempts, particularly those relating to water filters. The device can be easily attached to a conventional exhaust stack; and its operation includes catching the saturated smoke, filtering the smoke residue, and reusing the moisture to saturate still other smoke in the atmosphere. The invention consists of a conduit means having a number of angularly displaced vertically spaced nozzles which are connected in fluid flow communication with a water pressure means such that water can be forced through the nozzles to create a circular array of moisture laden fog, thus saturating the smoke and causing it to fall by gravity from the atmosphere. A cover is supported on the smoke stack between the exhaust opening and the fog generating device to prevent moisture from falling into the exhaust opening.

30777 **APTIC NO. 53507**

Santa Cruz, Leon M.

ANTI-SMOG AND EXHAUST DEVICE. *(Assignee not given.) U. S. Pat. 3,712,031. 7p., Jan. 23, 1973. 10 refs. (Appl. March 19, 1971, 8 claims).*

This invention discloses an anti-smog and exhaust device positioned rearwardly of a typical muffler, as used in an internal-combustion engine exhaust system. The specific device comprises a rotatable drum adapted to receive a filter unit therein for rotation with the drum about a tubular pipe that is fixedly connected to the exhaust system at one end and connected at its opposite end to a reservoir which supplies a liquid chemical by means of a pumping system to the rotating drum by way of the tubular pipe. The liquid intermingles with the exhaust fumes as they pass from the muffler to the interior of the drum and thereby transports the foreign particles and elements of the fumes into the filter unit, allowing the cleaned exhaust gases to enter the reservoir area where they once again are sprayed by a mist of the liquid before being expelled to the atmosphere as non-contaminated fumes. The present system differs from others developed to date in that it is easy and sufficiently inexpensive to install in the average vehicle on the road today. (Author abstract modified)

30778 **APTIC NO. 53051**

Scharf, Allan

CONTROL OF AIRBORNE DUST PRODUCED BY PNEUMATIC JACKPICK WITH WATER ATTACHMENTS: REPORT III. *Am. Ind. Hyg. Assoc. J., 34(1):48-53, Jan. 1973. 4 refs.*

The dust suppression capabilities of a cone-shaped water attachment for pneumatic jackpicks (Mark 3) are compared with similar capabilities of a coil-shaped attachment (Mark 4). The Mark 4 design, in the field, significantly reduced hazardous sandstone dust concentrations when compared with the Mark 3. The Mark 4 used significantly less water. There was a tendency for the percentage of decrease in dust to be associated with the percentage of the water reaching the impact point of the jackpick steel. (Author abstract)

30779 **APTIC NO. 53464**

Scheers, A. H.

SAFETY SYSTEMS AND AIR POLLUTION. PART 6. *(Veiligheidssystemen en luchtverontreiniging. 6.). Text in Dutch. Polytech. Tijdschr., Ed. Procestechniek (The Hague), 28(11):356-368, May 1973.*

Problems of the heat radiation density occurring during torch (flare) eruptions, a modern method for the design of torches with increased discharge rates, and a method developed for smokeless combustion in torches by the admission of water vapor are described. The maximum heat radiation density within a determined radius around torches is not permitted to exceed 4.73 kW/sq m. The maximum increase in temperature at ground-level due to torch operation should not exceed 0.2 C. A modern method permits the use of increased discharge rates above 0.2 Mach, and consequently of reduced flare tip diameters and tip heights. The admission of water vapor under 18 atm into the gases to be burned results in intensified mixing of the gases with air, intensified turbulence, and water gas reaction due to the elevated temperature.

30780 **APTIC NO. 53565**

Scheltinga, Henri M. J.

FARM WASTES PURIFICATION AND SOLIDS DISPOSAL. *Ber. Abwassertech. Ver., (26):125-131, 1973. 13 refs.*

Farm wastes may cause surface water pollution, air pollution by odor, soil pollution, and hence groundwater or surface water pollution by drainage and runoff. By aeration and aerobic action of microorganisms, odor problems arising from storage of farm waste slurry can be combated effectively. Ventilation air from livestock and poultry buildings can be scrubbed in a biowasher. These methods are expensive. A less expensive solution is the keeping of sufficient distance between livestock/poultry buildings and neighboring human dwellings. New York State now has its guidelines for controlling contaminant emissions from animal production farms. The states of Nebraska, Kansas, Wisconsin, Maine and Washington are also moving in this direction. The Ontario Code of Practice recommends the following distances between stables and human dwellings: 2000 feet at least from land presently zoned for residential use, 1000 feet at least from dwellings on adjacent property, 300 feet at least from the center line of any public road, and 200 feet at least from the lot lines of the site on which the production unit is situated.

30781 **APTIC NO. 53550**

Seversky, Alexander P. de

WET ELECTROSTATIC PRECIPITATOR. *(Electronatom Corp, New York) U. S. Pat. 3,716,966. 8p., Feb. 20, 1973. 41 refs. (Appl. Aug. 31, 1960, 4 claims).*

A wet electrostatic precipitator of exceptional efficiency for cleaning contaminated gases is presented. The contaminated gases are conveyed through an electrostatic field between electrode surfaces. Particles in the gas are precipitated onto a collecting surface constituted by a film of water flowing over a collector. The precipitator is self-cleaning and is particularly suited to non-industrial uses. It can also be advantageously used for extracting radioactive particles from the atmosphere in case of fallout. The precipitator is provided with a water film type in which the water flows uniformly and smoothly on the walls of the collector tubes, thus avoiding dry patches. A water distributor is provided which discharges multiple streams tangentially against the surface of the collector, the streams being diverging and intersecting. The precipitator requires substantially less power to operate than conventional gas cleaners. It is also provided with a power supply which generates pulsed voltages of high amplitude to produce an ionizing field, making it less costly. Designs of the wet precipitator are given.

30782 **APTIC NO. 53229**

Shibuya, Itsuro

THE EFFECT OF NOX ON STEEL INDUSTRY AND COUNTERMEASURES. *(Tekko gyokai e no hamon to taisaku). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(4):494-498, Sept. 1973.*

Absorption desulfurization equipment with 95% efficiency has been added to a boiler of a steel company. Another steel plant removes 500 N cu m/hr nitrogen oxides from the sintering exhaust by activated carbon adsorption. Next year a 50,000 N cu m/hr plant will be constructed. Another desulfurization process is being developed in which calcium chloride is used as an absorbent. Two-stage combustion is being studied as a method of removing NOx from automobile and power industry exhausts. In the steel industry, because iron does not melt below 1200 C, NOx removal techniques are accompanied by more difficulties.

30783 **APTIC NO. 52689**

Sogawa, Kazuyuki

DUST COLLECTION EQUIPMENT FOR GLASS INDUSTRY AND COUNTERMEASURES AGAINST ITS NOISE (I). *(Garasu kogyo no shujin sochi to soon taisaku). Text in Japanese. Kagaku to Kogyo (Tokyo) (Chem. Chem. Ind.), 47(7):294-300, July 1973.*

The various kinds of dust collectors used in glass-manufacturing processes are discussed. In electrostatic dust collectors, particles in the stack gas are charged with a corona discharge and separated and collected on electrodes. The particle size which can be removed is 0.01-10 micron; dust collection efficiency is 90-99.5%; loss of pressure is 15-50 mm Aq; and while the construction cost is high, the operating cost is low. Bag filters can treat 0.1-1-10 micron size dust; efficiency of dust collection is 90-99.5%; loss of pressure is 100-200 mm Aq; and installation costs are high and operating costs are medium.

30784 **APTIC NO. 52999**

Sokol skiy, D. V. and N. M. Popova

CATALYTIC PURIFICATION OF EXHAUST GASES. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Catalytic Purification of Exhaust Gases. M. Y. Nuttonson (ed.), Vol. 20, Silver Spring, Md., American Institute of Crop Ecology, APTD-1452, 1973, 169p. 480 refs. Translated from Russian.*

NTIS: PB 221279

Air pollution in large cities and in closed industrial premises, and the toxicity of automobile exhaust gases under various operating conditions are discussed. Methods of reducing the atmospheric concentration of noxious substances are reviewed, with special emphasis on the catalytic oxidation of carbon monoxide, the complete oxidation of hydrocarbons, and the removal of nitrogen oxide from gaseous mixtures. A survey of relevant literature is presented. Some observations on new catalysts that were investigated, on methods of obtaining active, stable, low-percentage catalysts of carbon monoxide oxidation, on the role of carrier and on the mechanism of the process are presented.

30785 **APTIC NO. 53566**

Spedden, Henry Rush, Kenneth J. Richards, and William J. Schlitt, III

DRY CYCLIC PROCESS UTILIZING A MANGANOUS OXIDE ABSORBENT FOR REMOVAL OF DILUTE SULFUR VALUES FROM GAS STREAMS. *(Kennecott Copper Corp., New York) U. S. Pat. 3,723,598. 6p., March 27, 1973. 8 refs. (Appl. Nov. 5, 1970, 8 claims).*

A dry cyclic process utilizing a manganous oxide absorbent is presented for the removal of dilute sulfur values, such as sulfur dioxide and sulfur trioxide, from gas streams. The process is applicable to waste effluents from industrial sources such as stacks of smelters, and power plants. Manganous oxide is an excellent absorbent at the relatively low temperatures normally prevailing in effluent stack gases (100-400 C) and is amenable to quick, easy, and economical regeneration in a completely dry state by calcination under reducing conditions. Regeneration is easily accomplished by calcining the spent manganous oxide absorbent (manganese sulfate) in the presence of a reducing agent, such as a carbonaceous material or hydrogen gas. The regenerated absorbent material, following regeneration from the sulfate back to manganous oxide, is recycled to the gas absorption stage for reuse. The entire process is dry, easily handled, economical, and effective. (Author summary modified)

30786 **APTIC NO. 53567**

Spedden, Henry Rush

PROCESS FOR RECOVERING VOLATILIZED RHENIUM OXIDES AND SULFUR OXIDES FROM GAS STREAMS. *(Kennecott Copper Corp., New York) U. S. Pat. 3,723,595. 5p., March 27, 1973. 3 refs. (Appl. July 12, 1971, 13 claims).*

A process for recovering volatilized rhenium oxides and sulfur oxides from gas streams has been developed wherein the stream is scrubbed with an aqueous alkaline solution (e.g., an ammonium or an alkali metal solution) containing ions capable of forming sulfites and bisulfites. Practically all of the sulfur oxide is removed as a soluble sulfite; while the rhenium oxide is dissolved in the sulfite solution, which is maintained alkaline for the purpose of such dissolution. The rhenium-bearing sulfite solution is treated by a known means, such as ion-exchange or solvent-extraction, to recover the rhenium oxide contained therein. The effluent sulfite solution is they employed as the scrubbing solution in a second gas scrubbing stage in which a different sulfur oxide-containing gas stream, such as the exit gas from a sulfuric acid plant with substantially no rhenium content, is scrubbed to extract sulfur oxide, making effluent sulfite solution acid and converting the sulfites into soluble bisulfites. Sulfur values are preferably recovered from the resulting bisulfite solution. (Author abstract modified)

30787 **APTIC NO. 52697**

Squires, B. J.

GROWING USE OF FABRIC FILTER DUST COLLECTORS IN THE STEEL INDUSTRY. PART 1. *Steel Times (London), 201(5):380-387, May 1973. 3 refs.*

The cleaning of the exhaust gases from modern steel melting furnaces is investigated. Tubular cloth filters with mechanical vibration tube cleaning, tubular cloth filters with a blow-back cleaning system, and tubular felt filters with high-pressure pulse cleaning are described. They are easily compartmentised, suitable for continuous operation with easy maintenance, and do not have the disposal problems normally associated with wet scrubbers and wet electrostatic precipitators. Apart from gas temperature, which is easily automatically controlled, fabric filters are little affected by dust load, particle size, and gas quantity. Open-hearth and electric arc furnaces are discussed.

30788 **APTIC NO. 52859**

Stabenow, G.

RESULTS OF THE STACK EMISSION TESTS AT THE NEW CHICAGO NORTHWEST INCINERATOR. *J. Eng. Power, 95(3):137-141, July 1973. 7 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, New York, Nov. 26-30, 1972.)*

The results of the stack emission tests undertaken at the new Chicago northwest incinerator are presented. Tests were done to determine particulate emissions to the atmosphere, burn-out residue, total plant capacity, and the efficiency of the steam generating equipment. Equipment design for reducing stack emissions, particulate concentration in the gas stream, and future trends in gas cleaning methods are discussed. The improvements in cleaning of the stack gases from incineration with a better method of combustion and the application of electrostatic precipitators are considered.

30789 **APTIC NO. 53545**

Stupf, Ewald and Tammo Haan

FILTER DEVICE AND METHOD FOR THE MANUFACTURE THEREOF. *(Luwa AG, Zurich (Switzerland)) U. S. Pat. 3,716,970. 7p., Feb. 20, 1973. 4 refs. (Appl. Aug. 13, 1970, 17 claims).*

A filter device comprising zig-zag folded substantially flat filter material is presented. The device provides a plurality of parallel tubular-shaped elements defining bead means or elevated portions secured to one side of the filter material. The tubular-shaped elements extend perpendicular to the folds of the filter material and serve to support such folds in spaced relationship from one another. A method for manufacturing the filter device was devised in which prior to the formation of the folds, at least one tubular-shaped element is formed, then an adhesive material is applied to the element which adheres the element to the neighboring portions of the filter material.

30790 **APTIC NO. 52757**

Suetaka, Toru

STUDY OF DEODORIZATION BY COMBUSTION I OXIDATION REACTIONS OF ETHYLMERCAPTANE, DIETHYL SULPHIDE, METHYLAMINE AND TRIMETHYLAMINE. *(Nensho dasshuho no kenkyu I Echiru merukaputan ryuka echiru, mechiru amin torimechiruamin no nensho hanno). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 8(2):101-105, June 1973. 5 refs.*

The oxidation of ethyl mercaptan, ethyl sulfide, methyl amine, and trimethyl amine with air was studied in a tubular reactor at 300-500 C. Oxidation rates of the osmogenes were in the following order: ethyl mercaptan greater than ethyl sulfide greater than trimethyl amine greater than methyl amine. This order is to be expected considering the minimum ignition temperature of hydrogen sulfide versus that of ammonia. The overall order of the reactions and the activation energies of the reactions were determined from the experimental data. The order and the activation energy were, respectively, 1.5 and 15 Kcal/mol for ethyl mercaptan; 2.6 and 24 Kcal/mol for ethyl sulfide; 2.4 and 33 Kcal/mol for methyl amine; and 1.8 and 20

Kcal/mol for trimethyl amine. Since the overall orders of the reactions were not integer, the oxidation reactions of the osmogenes should be complex. The overall reaction orders did not change within the limits of the experiments.

30791 **APTIC NO. 52925**

Suzuki, Suguru

COUNTERMEASURES AGAINST BAD ODORS AT A KRAFT PULP FACTORY.

(Kurafuto parupu kojo ni okeru akushu taisaku ni tsuite). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 9(6): 578-587, June 1973.

Odors are emitted by the digester, evaporator, and recovery furnace of kraft pulp factories. Odors can be controlled by collection and combustion, oxidative treatment of black liquor, and deodorizing of the condensate. Absorption and masking are recommended, but must be combined with other methods. The chief ingredients of non-condensable gas from digesters are methyl mercaptan and dimethyl sulfide. The gas combustion method is recommended for non-condensable gas; methyl mercaptan is easily dissolved in an alkaline solution and oxidized by chlorine. The sodium sulfide and methyl mercaptan in black liquor are oxidized to form stable oxides which reduces odor emission.

30792 **APTIC NO. 53282**

Syrota, J. and G. Autouard

AIR POLLUTION CONTROL IN PIG IRON FOUNDRIES.

(La lutte contre la pollution atmospherique dans les fonderie de fonte). Text in French. Mines Metallurgie, (102):25-36, April 1973. 7 refs.

Steps taken in France against air pollution caused by particulate matter and carbon monoxide emitted from pig iron plants are delineated; various types of blast furnaces are described; and the apparatuses used to minimize air pollution are detailed. There are about 300 blast furnaces in France which produce 2.5 million tons of cast iron annually. The particulate matter emitted from their operation derives from the metallurgical coke, iron ore, and fluxes with which the furnaces are charged, and the carbon monoxide is produced by incomplete combustion. Laws governing the operations of blast furnaces try to reduce the pollutants to a minimum, to disperse the unavoidable pollutants in an efficient manner, and to verify the control of these measures. A number of devices are used for filtering out the particulate matter before it can emerge from the foundries, such as those using decantation and the wet caps. Devices for prevention of emission of gas include: cyclones; washers, the most efficient being the venturi tubes under high pressure and the disintegrators; sleeve filters; and electrostatic filters. The installation and maintenance costs of these various filters are calculated, and their efficiency is evaluated. Recommendations for improvement of existing foundries and specifications for new plants are delineated.

30793 **APTIC NO. 53259**

Takatori, Shoroku

ON WET METHOD FOR ELIMINATION OF NITROGEN OXIDES IN BURNING GAS.

(Nensho gasu no chisso sankabutsu no shisshiki jokyo ni tsuite). Text in Japanese. Preprint, Research Group for Environmental Techniques, Osaka (Japan), p. 131-144, 1973. (Presented at the Seminar on Environmental Techniques, Osaka, Japan, May 16-17, 1973.)

Nitrogen oxide removal method are described including adsorption by activated carbon, adsorption by silica gel, oxidation by sodium hypochlorite solution and washing with sodium hydroxide, and washing with ferrous sulfate. Ways to oxidize nitric oxide to nitrogen dioxide for more complete removal are mentioned. The durability of the adsorbents, efficiency of the methods, and operating variables are mentioned.

30794 **APTIC NO. 52735**

Tanaka, Nobutoshi, Kazutaka Makino, and Koichi Iinoya

THEORETICAL ANALYSIS OF DUST CLEANING OPERATIONS IN MULTI- COMPARTMENT BAG FILTER.

(Tashitsu baggu firuta no funjin haraiotoshi sosa ni kansuru rironteki kosatsu). Text in Japanese. Kagaku Kogaku (Chem. Eng.), 37(7):72-78, July 1973. 7 refs.

A mathematical model of a bag filter with four parameters is formulated on the basis of some simple postulates. With this model the pressure drop across a timer-type bag filter, or the period of dust cleaning in a pressure switch type, can be calculated for a wide range of practical conditions. The effects of the dust cleaning residue fraction and number of compartments on the results are discussed. The pressure drop in a timer type, or the cleaning period in a pressure type, can be obtained easily by use of only a sheet of figures. Conversely, the dust cleaning residue fraction can be estimated easily by measuring pressure drop, or the cleaning period, which is easy to do on the outside of a bag filter. With an increase in the number of compartments, the pressure drop in a timer type is decreased and the cleaning period in a pressure switch type is increased, i.e., the lifetime of a bag is increased in each case.

30795 **APTIC NO. 53557**

Terrana, Jack D. and Leo A. Miller

PROCESS FOR THE REMOVAL OF SULFUR DIOXIDE FROM A SULFUR DIOXIDE-CONTAINING GAS.

(Wellman-Lord, Inc., Lakeland, Fla.) U. S. Pat. 3,719,742. 8p., March 6, 1973. 7 refs. (Appl. July 23, 1970, 12 claims).

A process for treating metal pyrosulfites such as potassium, cesium, and rubidium pyrosulfites to obtain the corresponding metal sulfide is disclosed. Specific application is directed to a system where the pyrosulfite is obtained as a result of reacting sulfur dioxide-containing gases with an aqueous absorbing solution of the corresponding metal sulfite to produce a spent absorbing solution containing dissolved metal bisulfite and then recovering the metal bisulfite in the form of the corresponding metal pyrosulfite (e.g., by cooling the spent absorbing solution to crystallize out the pyrosulfite). The process involves heating the pyrosulfite in the presence of a reducing agent such as carbon, carbon monoxide, hydrogen, hydrogen sulfide, or their mixtures to convert the pyrosulfite to the corresponding metal sulfide. The metal sulfide may then be reacted with water and carbon dioxide to form the corresponding metal carbonate (which can be recycled to the SO2 absorbing solution) and hydrogen sulfide. The H2S from the latter step can be mixed with SO2 and the mixture subjected to the Claus reaction to produce elemental sulfur and water. (Author abstract modified)

30796 **APTIC NO. 53069**

Thistlewayte, D. K. B., B. Hardwick, and E. E. Goleb

ODOUR NUISANCES FROM WASTE DISPOSAL WORKS AND TECHNIQUES FOR DEODORIZATION.

Chim. Ind., Genie Chim., 106(11):795-801, May/June 1973. 8 refs. (Presented at the Congres Le Genie Chimique au Service de l Homme, Paris, France, Sept. 1972.)

Detailed practical data regarding the odorous constituents found in the gaseous effluent from industrial and domestic waste disposal works are presented and methods of deodorization are discussed. The pollutants include sulfides, ammonia, amines, terpenes, chlorine, hydrogen chloride, aldehydes, and organic acids. These odors can be controlled by simple dilution, incineration or catalytic combustion, and/or deodorization. Deodorization may involve: chemical treatment using chlorine or hypochlorite applied mostly in solution; treatment by absorption in lime solutions; or treatment by gaseous ozone. Experimental data regarding the following two methods of deodorization are presented: a catalytic oxidation technique where oxidation occurs by the oxygen contained in the air stream; and a system of biological treatment whereby pollutants are filtered through tubular membranes made of polythenes, polytetra fluoroethylenes, and silicone rubbers. With the former method, removal of up to 99.2% of the odor was effected, and with the second method, a gaseous pollutant removal of up to 100% was effected.

30797 **APTIC NO. 53272**

Todo, Hisayuki, Yoshihide Kodera, Jo Kurita, Kiyoshi Ogawa, and Toshio Sato

MANUFACTURING METHOD OF HYDRODESULFURIZATION CATALYST. *(Suisoka datsuryu shokubai no seizoho). Text in Japanese. (Ministry of International Trade and Industry (Japan), Agency of Industrial Science and Technology) Japan. Pat. Sho 48-23791. 2p., July 16, 1973. 2 refs. (Appl. July 15, 1968, 1 claim).*

This invention concerns the manufacturing of a catalyst used in hydrodesulfurization of residual oil. To manufacture the catalyst, a water solution containing the specified amounts of molybdenum trioxide and cobalt oxide or nickel oxide or both whose mixing ratio is also as specified is added to active alumina powder and then kneaded. After molding and drying, the mixture is baked. The catalyst so manufactured features high activity. This results from the fact that the active alumina powder has been baked at 500-600 C and that the precisely controlled mixture of molybdenum trioxide and cobalt oxide or nickel oxide in a water solution is added to the alumina powder, kneaded, molded, and baked. The new manufacturing method also does away with the strong binding between the molybdenum trioxide and the alumina usually observed when alumina hydrate or alumina gel is used. Compared with similar catalysts manufactured by other conventional methods, the new catalyst gives 84% desulfurization efficiency against 71% or 80% achieved by other similar catalysts.

30798 **APTIC NO. 53505**

Tsuji, Shoichi

CONTROL TECHNIQUE FOR NITRIC OXIDE -- THEORY ON OPTIMUM COMBUSTION CHAMBER. *(Chisso sankabutsu no seisei yokusei -- saiteki nenshoshitsu ni kansuru riron). Text in Japanese. Ishikawajima-Harima Giho (Ishikawajima-Harima Eng. Rev.), 1973:3-12, May 1973. 8 refs.*

A theory on an optimum combustion chamber for the control of nitric oxide is discussed. The NO emitted from stationary or mobile sources is known as one of the indisputable causes of photochemical smog. Since the NO is produced by fixation within a furnace of either the atmospheric nitrogen or N2 in fuel, control of its emission rate is potentially possible by modifying the combustion method. On the basis of theoretical considerations of an ideal combustion chamber that is to operate at the minimum NO emission with respect to relations between radiative heat transfer characteristics, temperature distribution, and NO equilibrium concentration, it is concluded that the formation of NO is closely related to the flame temperature in a form of exponential function, not the average temperature, but the temperature distribution is of great importance. In combustion chambers with flames of comparatively great optical thickness, such as of large boilers or heating furnaces, the formation of NO may be reduced and the thermal efficiency increased by forming the flame zone uniformly along the chamber wall, when the maximum flame temperature potential is proportional to the areal combustion load rate. But in chambers with flames of comparatively small optical thickness, such as of gasoline engines, diesel engines, or gas turbines, the combustion chamber must be filled uniformly with flame to reduce the formation of nitric oxides, when the maximum flame temperature potential is proportional to the volumetric combustion load rate. This, however, inevitably reduces the thermal efficiency.

30799 **APTIC NO. 53216**

Ulmer, Georges

DUST REMOVAL FROM CUPOLA FURNACE-EMITTED FUMES. *(Le depoussierage des fumees de cubilot). Text in French. Fonderie Belge, 43(2):7-20, 1973. 36 refs.*

In France, particulate emission from cupola furnaces on the order of 10,000 tons/yr, or 1% of total particulate pollution. The many devices existing for the reduction of these emissions must consider the discontinuous functioning of the cupolas. Combustion gas contains carbon dioxide, carbon monoxide, water, hydrogen, and sulfur dioxide, the particulates contain silicon, cadmium, iron, aluminum, manganese, and zinc. Emissions from the mouth of the cupola contain 6 to 12 g cu m N particulates, from the stack 2 to 6 g cu m N. Particulate separation can be accomplished by mechanical separation (gravity, inertia, centrifugal effect), by scrubbing, by filtration, or by electrostatic precipitation. Separators can also be classified into those not requiring mechanical gas propulsion (sedimentation chamber with baffles, large volume decantation chamber and wet cap) and those that do (cyclones and multicyclones, wet scrubbers, filters, and electrostatic precipitators). If the combustion gas is diverted from the cupola directly into the separator without preceding combustion, a danger of explosion from CO and from pyrophoric dust exists; the explosion danger is reduced by humidification of these gases. At the end of the run of the cupola escaping gases are especially hot and have to be discharged directly into the atmosphere if bag filters are used for purification. Pressure fluctuations in the cupola ovens are considerable which is the reason why most of the purification devices do not work with the effectiveness indicated by their manufacturers. Cyclones have a general effectiveness of 43 to 89.5% (four out of 10 exceed 80%), venturi scrubbers have an effectiveness of 87.5 to 98.5% (four out of six exceed 92%).

30800 **APTIC NO. 52712**

Utsunomiya, Shigeyasu

PLANNING AND OPERATION OF WELLMAN-LORD DESULFURIZATION PROCESS. *(Ueruman rodo shiki haien datsuryu no keikaku to jisshi). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 40(7):640-646, July 1973.*

The operating variables of the Wellman-Lord desulfurization process were examined based on the data from flue gas desulfurization plants. The process is a wet desulfurization technique using sodium sulfite or potassium sulfite and constitutes a washing-absorption and reclamation-regeneration method. The absorption tower consists of a pre-scrubber and two absorption stages. The operating characteristics and cost analysis are examined.

30801 **APTIC NO. 53552**

Walkenhorst, Wilhelm

ELECTRICALLY OPERATED DUST MASK. *(Bergwerksveband G.m.b.H., Essen-Kray (West Germany)) U. S. Pat. 3,724,174. 5p., April 3, 1973. 16 refs. (Appl. Sept. 28, 1970, 2 claims).*

A breathing filter for dust filtering masks in which electrodes in the form of insulated metal wires are employed is presented. The polarity of the electrodes changes in periods which are of greater duration than the duration of dust particles in the filter, but are less than the time required for equalizing the difference in potential of the electrodes. Hardly any electrical energy is used so that a source of voltage of low yield can be used. The filter is for use for dust filtering masks for the separation of particles out of gases in mining, in construction, and in jobs with danger of explosion or other considerations are additionally to be considered.

30802 APTIC NO. 53496

Watanabe, Tetsuya

ON THE CRYSTALLIZATION OF CALCIUM SULFATE IN GYPSUM PROCESS OF EXHAUST GAS DESULFURIZATION. *(Sekkoho haigasu datsuryu ni okeru shoseki no kiso kenkyu). Text in Japanese. Ishikawajima-Harima Giho (Ishikawajima-Harima Tech. Rev.), 1973:13-19, May 1973. 16 refs.*

Experiments on the crystallization of calcium sulfate in the gypsum process of exhaust gas desulfurization were performed under various conditions in an experimental cell of 86 mm inside diameter and 2600 mm height. Calcium sulfate suspension was fed from the top and air mixed with oxygen was blown up through a perforated plate at the bottom. As conditions for obtaining large crystals, larger partial pressure of oxygen and higher liquid temperature were favorable. Though the oxidation and the crystallization occur in a cell, the crystallization process is governed by the oxidation rate. The equations generally used for crystallization can also be applied to this process.

30803 APTIC NO. 52730

Wen, C. Y. and M. Ishida

REACTION RATE OF SULFUR DIOXIDE WITH PARTICLES CONTAINING CALCIUM OXIDE. *Environ. Sci. Technol., 7(8):703-708, Aug. 1973. 16 refs.*

The rates of reaction of sulfur dioxide with pelletized calcium oxide particles and calcined limestones were investigated. Reaction rates of CaO particles and SO2 in an air stream were measured at 590-860 C. At low temperatures, the overall rate was controlled by the rate of reaction taking place on each of the CaO grains embedded in the agglomerated mass. At high temperatures, the overall reaction rate was influenced by particle size indicating restriction by the diffusion process. The overall rates for larger particles influenced by diffusion were substantially lower than those for the smallest particles, which were probably chemically controlled. At a given temperature, the effect of diffusion increased with increasing particle size. The effect of particle size on the overall reaction rate is explained by a proposed grain model. Reaction rates with various types of limestone were correlated in terms of the size of the crystalline grain. (Author abstract modified)

30804 APTIC NO. 53512

Wilson, Harold W.

PROCESS FOR THE ENTRAPMENT AND RECOVERY OF SULFUR DIOXIDE GAS. *(Golden Cycle Corp.) U. S. Pat 3,720,754. 4p., March 13, 1973. 7 refs. (Appl. Dec. 18, 1970, 11 claims).*

A process for the entrapment and recovery of sulfur dioxide gas is disclosed wherein sulfur dioxide gas or sulfur dioxide containing waste stack gases, are passed into a bed of mixed metallic oxides and silicates which contains not less than about 1% or more than about 10% of its weight in added water to produce a dry, particulate product comprising metallic sulfite salts, meta-silicic acid, adsorbed sulfur dioxide, and unreacted oxidic and siliceous material of a kind and amount dependent upon the chemical nature and reactability with SO2 gas of the metallic oxide silicate material processed. The product when subsequently moderately heated releases substantially equimolar amounts of SO2 in conjunction with the release of only minor amounts of water. (Author abstract modified)

30805 APTIC NO. 52887

Winkler, Heinrich

ELECTROSTATIC PRECIPITATORS FOR CLEANING AIR AND WASTE GASES IN INDUSTRIAL PLANTS. *Siemens Rev., 40(4):183-186, April 1973. 3 refs.*

Toxic materials and pollution of different forms and quantities must be separated, removed, destroyed or safely stored as waste products. Electrostatic precipitators are indispensable aids for obtaining conditions which protect the environment. Electrostatic precipitators can be used in iron and steel works for cleaning blast-furnace gas by the wet or dry process, and for converter dust removal. They can be used in cement works for the removal of rotary kiln dust and in high-grade air-conditioning plants for air cleaning. Dust removal efficiency of up to 99.9% is obtained.

30806 APTIC NO. 53551

Winsor, John and John Carruthers

DESULPHURIZATION AND HYDROGENATION OF AROMATIC-CONTAINING HYDROCARBON FRACTIONS. *(Assignee not given.) U. S. Pat. 3,714,030. 9p., Jan. 30, 1973. 5 refs. (Appl. Nov. 13, 1970, 16 claims).*

A liquid phase process is disclosed in which an aromatic- containing hydrocarbon fraction containing up to 50 ppm weight of sulfur is desulfurized in the presence of only enough hydrogen to dissolve in the liquid feedstock at the process conditions. The fraction is passed upwardly or downwardly through a bed of supported nickel catalyst which is preferably nickel sepiolite. The process may be preceded by conventional catalytic hydrodesulfurization and/or followed by hydrogenation, in one stage if the feedstock contains less than 30% by weight of aromatics and in two stages if the feedstock contains more than 30% by weight of aromatics. (Author abstract)

30807 APTIC NO. 52927

Yamaguchi, Takaaki

EXAMPLES OF COUNTERMEASURES AGAINST BAD ODORS AT AN OIL REFINERY. *(Sekiyu seisei kojo nado no akushu boshi taisaku-rei). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 9(6):572-577, June 1973.*

Oil refinery odors consist mostly of non-methane hydrocarbons, sulfur compounds, and a small amount of oxygen and nitrogen compounds. Since it is impossible to completely prevent odors from leaking out in a perfect closed system, two major control methods are used: preventing emission of odors and establishing deodorizing facilities. The absorption, combustion, solid particle absorption, and other control methods are discussed.

1972

30808 APTIC NO. 52766

Mitsui Aluminum Co., Ltd. (Japan), Miike Thermal Power Plant

WET TYPE CALCIUM BASE EXHAUST GAS DESULFURIZATION FACILITIES -- OUTLINE OF FACILITIES. *(Shisshiki karushiumu beisu haien datsuryu setsubi -- Setsubi gaiyo). Text in Japanese. 6p., May 1972.*

The Miike thermal power plant which generates electricity by burning coal uses a wet-type desulfurization method based on the Chemico calcium hydroxide scrubbing method. The equipment has great adaptability, small installation space, good pH adjustment, and high desulfurization and dust removal efficiency. This method can remove 65-75% of all exhaust gases with a K value of 11.7; 85-95% gas removal occurs with K equal to 5.26; 90% desulfurization and dust removal are guaranteed. Absorption of sulfur dioxide with calcium hydroxide produces calcium sulfate.

30809 APTIC NO. 53327

(Inventor not given.)

APPARATUS FOR REMOVING SOLID PARTICLES FROM COMBUSTION EXHAUST GASES. *(Waste Combustion Corporation, Richmond, Va.) Brit. Pat. 1,261,411. 9p., Jan. 26, 1972. (Appl. July 8, 1969, 19 claims).*

An apparatus for removing solid particles such as fly ash from combustion exhaust gases and an incinerator incorporating such an apparatus have been devised for burning large volumes of rubbish or waste material from commercial establishments, apartment houses, and the like. The device consists of a hollow casing member which encloses a chamber; a baffle within and extending across the chamber to divide the chamber into at least a pair of particle collection chambers, with the baffle providing a means for communication between the collection chambers; a conduit for receiving exhaust gases from the combustion zone, with the conduit having a discharge opening within one of the collection chambers; a burning means for burning waste combustible products in the exhaust gases within the conduit; and an exhaust stack extending into the casing and having an inlet opening positioned within the other collection chamber. The gases discharged from the outlet opening of the conduit will deposit solid particles in one of the collection chambers, and the gases thereafter will travel to the other collection chamber and deposit any further solid particles inside before entering the inlet opening of the stack.

30810 APTIC NO. 53003

Abel, William T., Michael Zulkoski, and Galen J. Gauntlett

DRY SEPARATION OF PYRITE FROM COAL. *Ind. Eng. Chem. Prod. Res. Develop., 11(3):342-347, 1972. 1 ref. (Presented at the American Chemical Society, Division of Fuel Chemistry, 162nd Meeting, Washington, D. C., Sept. 1971.)*

A dry separation process for removing pyrite from fine coal by use of centrifugal and electrostatic methods removed 30-50% of the total pyrite sulfur (equivalent to 50-70% of the available pyritic sulfur). Both separation methods were benefited by restricting particle size range and keeping pyrite particles as large as possible. Removal efficiency was increased by integrating the separation and grinding steps as in stage grinding. With stage grinding, nearly 90% of the available pyritic sulfur was removed from a Pittsburgh seam roof coal. (Author abstract)

30811 APTIC NO. 52954

Adelman, H. G., D. G. Andrews, and R. S. Devoto

EXHAUST EMISSIONS FROM A METHANOL-FUELED AUTOMOBILE. *Preprint, Society of Automotive Engineers, Inc., New York, 12p., 1972. 32 refs. (Presented at the Society of Automotive Engineers, National West Coast Meeting, San Francisco, Calif., Aug. 21-24, 1972, Paper 720693.)*

An American Motors Gremlin was converted to low-pollution operation on methanol through the use of an exhaust-heated intake manifold, a rejetted carburetor with heat exchanger for heating of fuel-air charge, a catalytic muffler, and an exhaust-port air injector. Tests demonstrated that this car surpasses the 1975-1976 federal standards for unburned hydrocarbons, carbon monoxide, and nitrogen oxides. The low levels of hydrocarbons and carbon monoxide are due to lean operation and the use of an oxidizing catalyst. The low nitrogen oxides emissions are due partially to retarded spark-timing and lean operation, and, as indicated in a chemical kinetic model of NO formation, to properties of methanol that are favorable to low NO levels. Results of gas chromatograph and chemical analyses of the exhaust for organics, aldehydes, and ammonia are also discussed. (Author abstract)

30812 APTIC NO. 53350

Allen, Richard H.

POLLUTION CONTROL APPARATUS FOR COMBUSTIVE DISMANTLING. *(David J. Joseph Co., Cincinnati, Ohio) U. S. Pat. 3,693,559. 10p., Sept. 26, 1972. 4 refs. (Appl. Nov. 22, 1971, 15 claims).*

Pollution control apparatus for combustive dismantling is described. The apparatus is used in the disposal of products of combustion created by burning a railway car. The apparatus includes a snorkel which can be raised and lowered over an opening in the top of the railway car. A fan is connected to the snorkel and draws products of combustion and discharges the products of combustion into a combustion chamber. The combustion chamber is heated to cause further burning of the products to eliminate partially burned portions. This invention provides for pollution control means for railroad car dismantling through combustive destruction of wooden components which is economical in orginal cost and operation. The device is suited for intermittent use at low maintenance costs. (Author abstract modified)

30813 APTIC NO. 53154

Altshuler, V. S. and A. A. Gavrilova

PURIFICATION OF GASES THROUGH HIGH TEMPERATURE REMOVAL OF SULFUR COMPOUNDS. *(Vysokotemperaturnaya ochistka gazov ot sernistykh soedineniy). In: American Institute of Crop Ecology. Purification of Gases Through High Temperature Removal of Sulfur Compounds. M. Y. Nuttonson (ed.), Vol. 18, Silver Spring, Md., American Institute of Crop Ecology, 1972, p. 1-141, APTD-1348. 42 refs. Translated from Russian. (Also: Akad. Nauk SSSR. Minist. Ugolnoy Prom. SSR. Inst. Goryuchikh Iskopaemykh. Izdatelstvo Nauka, Moscow, USSR, 148p., 1969.)*

NTIS: PB 212736

Dry, high-temperature methods which permit the preparation of fuel without any appreciable heat loss are presented for the removal of hydrogen sulfide and sulfur dioxide from heated gaseous mixtures. A study of the activity os solid reactants with H2S (3.06%) in excess water vapor at 1100 C, a linear velocity of the steam-gas mixture equal to 0.032 m/sec, and an actual contact time of 0.218 sec demonstrated that calcium oxide is one of the most effective reactants in the removal of H2S from gases at high temperature. Results of activity studies of solid reactants with H2S at 700 C showed the most effective ones to be pyrolusite, hematite, magnetite, siderite, and dolomite. Analysis of thermodynamic studies indicated that a high temperature process of removal of SO2 from flue gases is possible and should be carried out by using oxides and carbonates of calcium, magnesium, iron, and manganese over a wide temperature interval from 200 to 1000 C. The process of high-temperature removal of H2S from gases may find applications at thermal electric power plants in the preparation of sulfur fuel for combustion through its preliminary gasification.

30814 APTIC NO. 53247

Asukada, Tomonori

DESULFURIZATION MEASURES UNDER PETROLEUM CRISIS. PRINCIPAL MEASURES MAY BE DESULFURIZATION OF HEAVY OIL AND GASIFICATION DESULFURIZATION. *(Sekiyu kikika no teiioka taisaku. Honmei wa juyu datsuryu to gasuka datsuryu). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 2(8):50-55, Aug. 1972.*

Petroleum consumption and supply in Japan is discussed with respect to the petroleum crisis. New Japanese fuel and emission standards require the use of low-sulfur fuel, which is greatly in demand in other countries and which is in short supply. Possible control methods to avoid this problem include the use of liquefied natural gas, naphtha or raw petroleum combustion, importation of low-sulfur heavy oil, desulfurization of stack gas, and desulfurization or gasification of heavy oil. The economic and technical feasibility of these methods are discussed.

30815 APTIC NO. 53009

Balzanelli, Mario

HEATING PLANTS AND AUTOMOTIVE VEHICLES. *(Centrali termiche ed automezzi). Text in Italian. Lo Smog (Italy), 1972:12-14, 1972.*

A basic precondition of correct combustion is a furnace of a size commensurate with the heat output delivered, with the surface of the grating, and with the quantity and quality of fuel to be burned. Other conditions are stacks of appropriate profiles, adequate air supply from below, and in the case of oil burners, perfect pulverization of the fuel and a correct fuel-air mix. In large heating plants only electrostatic dust separators will eliminate particulates from effluents satisfactorily; wet scrubbing leaves much to be desired. Purification installations should preferably be placed between the boiler and the stack and should be proportioned so as not to reduce the draught of the stacks. Decanters are located at the outlet of effluent gases from boilers. This can be accomplished by inserting diaphragms into the lower part of the stack and by a succession of curvatures inside the stack which will impede the flow of much suspended matter which will fall to the bottom where it can be removed periodically. The dust thus recovered can be injected into the furnace again as fuel. From a heating installation using 400 tons/yr of oil, 1500 l/dust was recovered in this manner. Pollution from large heating installations serving whole blocks of buildings can be more easily controlled. An ideal solution would be the use of methane or of consumer gas for heating. But heating installations are not the principal cause of smog. Automobiles are a principal cause. Their emissions can be reduced by proper engine tuneup and by installation of afterburners. The use of liquid petroleum gas in buses and fleet vehicles is another way of reducing pollution.

30816 **APTIC NO. 53456**

Barkovitz, William E.

WET SCRUBBER DUST COLLECTOR. *(American Radiator and Standard Sanitary Corp., New York) U. S. Pat. 3,699,748. 7p., Oct. 24, 1972. 8 refs. (Appl. Oct. 24, 1969, 8 claims).*

A wet dust collector or scrubber having an inertial separator section for removing a substantial percentage of the dust particles from the treated gas stream is described. A porous packing is subjected to flushing liquid for producing a concentrated fog and assimilating the remaining dust particles into the fog. There is a second separator section for removing the wet dust particles from the gas stream. The first inertial section preferably comprises spaced baffles which are subjected to liquid spray for collection of dust particles and for prevention of clog-up of the baffle spaces. (Author abstract)

30817 **APTIC NO. 53179**

Beane, David J. and John H. Gastler

AFTERBURNER COMBUSTION APPARATUS. *(United Aircraft Corp., Hartford, Conn.) U. S. Pat. 3,698,186. 7p., Oct. 17, 1972. 7 refs. (Appl. Dec. 24, 1970, 15 claims).*

An afterburner combustion apparatus is described. The apparatus comprises flameholder-spraybars extending radially into the afterburner at a plurality of locations. A third of the flameholder-spraybars are full length and extend to a center body, a third are of medium length and extend to the center of a hot exhaust, and a third are short and extend inwardly to a point rearwardly of a splitter separating the hot exhaust from a cooler fan duct air. The medium length flameholder-spraybars are divided into two fuel injection compartments and the full length flameholder-spraybars are divided into three fuel injection compartments. For primary zone burning, fuel is admitted to the innermost compartment of each of the full length flameholder-spraybars; for secondary zone burning, the inner compartments of the medium length flameholder-spraybars and the middle compartments of the full length flameholder-spraybars then also have fuel directed thereto; and for tertiary zone burning, fuel is then also directed to the outermost compartment of each of the full length and medium length flameholder-spraybars and to the short length flameholder-spraybars. The close coupling of spraybars within flameholders eliminates the need for a separate heat shield. (Author abstract modified)

30818 **APTIC NO. 53517**

Bennett, Raymond G. and Mark Luedi

AIR CLEANER WITH IMPROVED UNLOADING APPARATUS. *(Nova Industrial Corp.-United Air Cleaner Div., New York) U. S. Pat. 3,696,591. 6p., Oct. 10, 1972. 2 refs. (Appl. June 7, 1971, 3 claims).*

A dry type air cleaner having a generally cylindrical housing with an air inlet at one end and a clean air outlet at the other end is described. The housing is constructed to set up a helical swirling motion of air to centrifuge dust particles to the outside. There is a cylindrical annular filter element assembly centrally located within the housing. The air cleaner also includes a dust unloading apparatus having a port for dust removal, a means for moving air which produces suction at the port, and a power source for driving the means. This air cleaner has a greater dust capacity than other air cleaners, has a high efficiency, and requires a minimal amount of maintenance. (Author abstract modified)

30819 **APTIC NO. 53290**

Biberacher, Gerhard

SELECTIVE REMOVAL OF NITROGEN DIOXIDE FROM GASES. *(Badische Anilin- und Soda-Fabrik Aktiengesellschaft, Ludwigshafen (West Germany)) U. S. Pat. 3,705,231. 4p., Dec. 5, 1972. 5 refs. (Appl. July 21, 1970, 4 claims).*

A process for the selective removal of nitrogen dioxide from gases is described. Nitrogen dioxide is selectively removed from gases which contain not only nitrogen dioxide in a strongly diluted form, but also oxygen by reaction with carbon monoxide at elevated temperatures in the presence of supported catalysts of platinum and/or palladium. The reaction takes place at temperatures ranging from 130 C to 425 C and the carrier used in alpha-aluminum oxide or silicon dioxide. The ratio of these oxides to one another is chosen in accordance with the predetermined temperature. This process is applicable in the chemical industry. (Author abstract modified)

30820 **APTIC NO. 53490**

Blackmore, D. R.

THE USE OF CATALYSTS IN CONTROLLING AUTOMOBILE EXHAUST EMISSIONS. *Sci. Prog., Oxf., 60(240):507-526, Winter 1972. 5 refs.*

The proposed 1975/1976 Federal emission standards have given new impetus to the development of catalytic reactors for the control of automobile exhaust emissions. Requirements for carbon monoxide and hydrocarbon oxidation catalysts, as well as nitric oxide reduction catalysts, are discussed. The catalysts must be able to control emissions from all engine modes without forming unwanted side products, and they should be resistant to attrition by chemical, hydrothermal, mechanical, and thermal mechanisms. Noble metal catalysts (e.g., platinum) for CO and HC oxidation are likely to be used with 1975 model cars. Candidate materials for NO reduction include transition metal oxides (e.g., chromium and iron), precious metals (e.g., platinum and palladium), copper oxides, copper chromites, and metal alloys (e.g., stainless steel). Examples of dual-bed reactors are given including a design in which an exothermic CO/HC reactor is built around a nitrogen oxides reactor. Such a system is the basis of much current research. Future work should be directed toward single-stage systems as they would simplify reactor design and reduce catalyst warm-up problems. Substantial work remains to be done to determine the sensitivity of catalysts to future fuel-oil components such as phosphorus compounds in unleaded gasoline. Efficient and durable reactors may cost considerably more than the $300 previously mentioned.

30821 **APTIC NO. 53205**

Bodine, Albert G.

SONIC INTERNAL COMBUSTION ENGINE EXHAUST AFTERBURNER. *(Assignee not given.) U. S. Pat. 3,631,792. 7p., Jan. 4, 1972. 9 refs. (Appl. June 15, 1970, 7 claims).*

A sonic internal combustion engine exhaust afterburner is described. The afterburner utilizes a valveless catalytic combustor in which acoustic resonant combustion is maintained, using the exhaust effluents of the engine. The sound wave action aids in keeping the catalytic surfaces clean by scrubbing action, the catalyst aiding in maintaining a resonant combustion. (Author abstract modified)

30822 **APTIC NO. 53128**

Boido, Giuseppe

DECANTATION AND SPOUTING CHIMNEY SMOKE PURIFYING DEVICES. *(Depuratore da fumo a decantazione e camino ad eiezione). Text in Italian. Lo Smog (Italy), 1972:15-18, 1972.*

If the velocity of gaseous effluents in a stack is reduced so that suspended particulates precipitate and fall to the bottom and if the velocity is subsequently raised, then purification of effluents by decantation is achieved requiring no servicing and no maintenance, no spraying of water, no electricity, and no ventilator. In practice this is achieved by affixing a hood inside the chimney at the site of the inlet of the fumes which are thus forced to flow downward before being turned upward again. The change of direction slows the gas flow velocity and accomplishes decantation. The soot accumulated at the bottom of the decanter is removed periodically. Better draught by a stack is achieved on windy days by extending two opposite sides of the top of a quadrangular chimney profile by planks to a height of 1/5 of the height of the chimney and by placing a horizontal roof on the two planks; two sides facing in the direction of the wind are left open. The chimney top rim on the open sides is executed with a downward slant towards the outside. If the two devices described above were affixed to all chimneys, the amount of particulate emissions would be drastically reduced and pollution of nonsedimentable pollutants would likewise be reduced by better dispersion.

30823 **APTIC NO. 53479**

Brewer, Gerald L.

THERMAL INCINERATION UNIT. *(Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,706,533. 4p., Dec. 19, 1972. 3 refs. (Appl. Dec. 28, 1970, 4 claims).*

An incineration unit for the thermal conversion of noxious fumes is described. The unit has a multiple set section, and a tubular form combustion chamber, where the sections are connected in a serpentine manner and positioned within a fume-receiving housing in a manner whereby the fumes pass over and around the plurality of sections in a heat exchange relationship. The unit is particularly adapted for use with wire enameling drying ovens where the fumes from the plurality of coated wires can pass laterally into the housing for the incinerator unit and transversely across the plurality of tubular sections comprising the combustion chamber. (Author abstract modified)

30824 **APTIC NO. 53443**

Bridge, Alan G.

MULTI-STAGE DESULFURIZATION. *(Chevron Research Co., San Francisco, Calif.) U. S. Pat. 3,696,027. 7p., Oct. 3, 1972. 9 refs. (Appl. Jan. 12, 1970, 5 claims).*

A multi-stage process for the hydrodesulfurization of heavy oil contaminated by metals is presented. The following stages are carried out under hydroconverting conditions: passing the heavy oil through a fixed bed of macroporous catalyst particles having high metals capacity and low desulfurization activity; passing effluent from the macroporous catalyst bed through a fixed bed of moderately active desulfurization catalyst particles; and passing effluent from the bed of moderately active desulfurization catalyst particles through a fixed bed of highly active catalyst particles. The process is applicable for the desulfurization of hydrocarbons. The multistage desulfurization process with increasingly active catalyst particles makes desulfurization more efficient. (Author abstract modified)

30825 **APTIC NO. 53472**

Brixius, Jacob K., Lawrence M. Takacs, and James P. Van Sweringen

FILTER. *(North American Rockwell Corp., Pittsburgh, Pa.) U. S. Pat. 3,698,161. 7p., Oct. 17, 1972. 3 refs. (Appl. Nov. 3, 1970, 2 claims).*

An air filter with the capacity to optimumly remove impurities from airstreams is described. The filter is distinguished from other filters in that it has an easily replaceable filter media which obviates any substantial down time of the air system. The housing has a flange portion disposed around it and a filter media retainer fixedly attached to it. The filter media is attached in an airtight manner on the flange portion. The retainer retains the filter media in such a position with respect to the airstream that it provides two coaxial filter pockets of substantially equal depth. This optimizes both the impurity removing properties of the filter media and the airstream pattern of the filter. The filter media retainer frame comprises a rectangular section and four diagonally disposed substantially V-shaped members. The rectangular section retains one of the filter pockets and the V-shaped members retain the other filter pocket. (Author abstract modified)

30826 **APTIC NO. 53306**

Burney, Ivan T.

WASHER MECHANISM FOR ELECTROSTATIC PRECIPITATOR. *(Westinghouse Electric Corp., Pittsburgh, Pa.) U. S. Pat. 3,704,571. 7p., Dec. 5, 1972. 19 refs. (Appl. May 27, 1970, 6 claims).*

An upright panel of at least one precipitator cell with a plurality of substantially vertical disposed plates was provided with a washer header assembly supported for traversing movement in fromt of the panel. A rotatable sprocket was journalled on the header assembly with its teeth engaging a sprocket chain supported in front of the panel along the path of the traversing movement of the header assembly so that the header assembly will traverse the panel as the sprocket is rotated. The device is to aid in the washing of precipitator cells to remove accumulated deposits on the precipitator plates at predetermined time intervals. (Author abstract modified)

30827 **APTIC NO. 52960**

Burtz, Richard D. and Rodney L. Burton

THE DEMONSTRATION OF AN EXTERNAL COMBUSTION ENGINE IN A CITY BUS. *Preprint, Society of Automotive Engineers, Inc., New York, 7p., 1972. 4 refs. (Presented at the Society of Automotive Engineers, National West Coast Meeting, San Francisco, Calif., Aug. 21-24, 1972, Paper 720682.)*

An external combustion engine (ECE) was designed, tested, and retrofitted to a 40 ft, 46-passenger city bus. The bus was tested and demonstrated comparable acceleration and lower external noise, odor, and air pollution emissions than a diesel bus. The external combustion engine bus fuel consumption was considerably higher than that of a diesel bus; however, ECE fuel consumption can be improved with further development, although not to lower levels than the diesel. More time is needed in service to determine the ECE bus operating costs, which depend largely on the costs of powerplant maintenance. (Author abstract modified)

30828 **APTIC NO. 53354**

Chew, Frank D.

SMOKE ABATEMENT APPARATUS. *(Assignee not given.) U. S. Pat. 3,706,538. 4p., Dec. 19, 1972. 11 refs. (Appl. Dec. 23, 1970, 4 claims).*

A method and apparatus for emulsifying smoke containing noncombustible materials and corrosive materials are described. Smoke is introduced into a converging diverging venturi, while a nozzle emits high velocity wetting fluid into the converging inlet to scrub and emulsify the smoke. The method is economical and can collect certain material from the smoke or gases that are of value. The smoke is introduced into the inlet of a converging diverging venturi and is scrubbed by a high velocity jet stream. A tank is connected to the diverging outlet of the venturi and collects the emulsified materials from the smoke. The venturi and tank are made of lead to resist corrosion. Acidic or base materials and a foaming agent enter the tank for reaction with the base or acid materials of the smoke. The foaming agent collects the noncombustible and/or nonsoluble material from the smoke which are removed by an exhaust pump. The emulsified material and fluid from the lower sump portion of the tank are also removed. (Author abstract modified)

30829 **APTIC NO. 52573**

Christiansen, Hans

THERMAL DRYING AND INCINERATION OF SEWAGE SLUDGE. FULL-SCALE EXPERIMENTS. *(Termisk torkning og forbrenning av slam. Forsok i teknisk malestokk). Text in Norwegian. Nordforsk Miljovardssekretariatet, Attonde Nordiska Symp. Vattenforskning, Skokloster, 1972, p. 163-176. (April 25-27.)*

A full-scale experiment with the thermal drying and incineration of sewage sludge in Norway is described. The sewage sludge is steam-dried in a rotary drum, and then incinerated together with communal waste in a waste incineration plant. The spent vapor from the drying drum is passed through a cyclone, and then is scrubbed in a scrubbing tower with cold water. Good combustion of dried sludge mixed with communal refuse was observed. The admixture of dried sludge and solid waste caused a slight rise in the waste gas sulfur dioxide content, and a slight reduction in the hydrochloric acid concentration.

30830 **APTIC NO. 53188**

Connor, John M. and Krikor D. Gureghiam

DUAL ABSORPTION SULFURIC ACID PROCESS. *(Chemical Construction Corp., New York) U. S. Pat. 3,653,828. 10p., April 4, 1972. 6 refs. (Appl. Sept. 24, 1969, 6 claims).*

A dual absorption sulfuric acid process is described. The process is provided, with intermediate scrubbing of the process gas stream to remove sulfur trioxide, in which the residual gas stream after intermediate scrubbing is heated to a temperature which is about 10 C to 50 C higher than the temperature of the initial hot process gas passed into the first stage of catalysis. The sulfur dioxide content of the heated residual gas stream is thus catalytically oxidized to sulfur trioxide using reduced amounts of catalyst. The improvement of this system arises from the fact that by operating the catalyst stage after the first absorption stage at a temperature higher than normal, typically with a 10-50 C difference, the catalyst quantity is reduced. This leads to a plant design with two conversion stages before the first absorption stage and one or two stages after the first absorption. (Author abstract modified)

30831 **APTIC NO. 53454**

Courbon, Paul

HUMID DE-DUSTING DEVICE FOR GAS-CONVEYOR CONDUITS. *(Charbonnages de France, Paris), U. S. Pat. 3,703,800. 4p., Nov. 28, 1972. 5 refs. (Appl. March 24, 1971, 7 claims).*

A humid dedusting device intended to free a flow of gas from the dust and solid particles which it carries in suspension is described. It comprises a venturi wherein water is sprayed and which is positioned between a junction converging portion having an apex angle in the vicinity of 90 deg and a junction diverging portion having an apex angle in the vicinity of 90 deg. This latter is provided with a means for setting into rotation the flow of humidified gas and with a centrifugal separation conduit with an axial transfer sleeve. This deduster device is of a small size and may be inserted into a conduit system of ventilation air such as the ventilation pipes of underground mine workings. Other dedusters are complicated and have dimensions and loss of pressure such that they can only be used in long conduits. (Author abstract modified)

30832 **APTIC NO. 52626**

Crynack, Robert Richard

PARTICLE CHARGING IN ELECTROSTATIC PRECIPITATION. *Carnegie-Mellon Univ., Pittsburgh, Pa., Dept. of Electrical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 120p. 27 refs.*

The factors affecting particle charging in electrostatic precipitators, especially the effects of gas composition and free electrons, were studied. Particle charge was determined for a range of corona charging potentials in negative and positive corona and for various gas compositions. The particle size distribution of aerosols in the precipitator was also determined using a light scattering method and a charge carrying method allied with a computer program. Well below sparkover, particle charge acquired in negative corona was only slightly greater than that acquired in positive corona at the same applied potential. However, near sparkover in air, particle charge acquired in negative corona was as much as twice that acquired in positive corona. The most significant effect occurred in a test gas with high nitrogen content. The effects of gas composition, including the effects of water vapor, carbon dioxide, and Freon-12, were studied. (Author abstract modified)

30833 **APTIC NO. 53297**

Deane, Clifford T.

AIR POLLUTION CONTROL DEVICE. *(Vortex Air Corp.) U. S. Pat. 3,693,326. 5p., Sept. 26, 1972. 9 refs (Appl. Feb. 16, 1971, 9 claims).*

Air polluting smoke particles are substantially removed from the upflow of smoke through a vertical series of housing sections into which water under pressure is injected closely below impeller blade assemblies. The blade assemblies are driven by a fluid motor through which the pressurized water is conducted to produce turbulence and mixing of the smoke with the water. The heavier water and smoke particles are flung radially outwardly to form a slurry which is baffled and collected from downwardly converging walls of the housing sections. (Author abstract)

30834 **APTIC NO. 52957**

Decher, Reiner, Abraham Hertzberg, and Richard C. Corlett

A COMPOUND CYCLE EMPLOYING TWO-STAGE COMBUSTION TO REDUCE AUTOMOTIVE AIR POLLUTION. *Preprint, Society of Automotive Engineers, Inc., New York, 10p., 1972. 21 refs. (Presented at the Society of Automotive Engineers, National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., Sept. 11-14, 1972, Paper 720736.)*

A concept is presented of a compound engine that has the potential of significantly reducing exhaust emissions. This cycle is based on a combination of components of the spark ignition engine and the gas turbine. The cycle utilizes a two-stage combustion process involving fuel-rich combustion at high temperatures to reduce nitrogen oxides formation and followed by lean burning to eliminate unburned hydrocarbons in a thermodynamically productive manner. A thermodynamic analysis of this cycle and a comparison with the conventional otto cycle is presented. The combustion processes involved are examined and methods of implementing this cycle in a practical manner are shown. The results of this analysis indicate that a practical automotive power cycle with excellent part load and transient response characteristics is possible via this approach. (Author abstract)

30835 **APTIC NO. 53338**

DeLisio, Michael P. and Robert L. Clement

GAS CLEANING SYSTEM. *(Arco Industries Corp., Detroit, Mich.) U. S. Pat. 3,695,004. 6p., Oct. 3, 1972. 7 refs. (Appl. Oct. 27, 1970, 17 claims).*

A gas cleaning system for cleaning gases from an incinerator in which the gas is discharged at a variable rate including a gas cleaning device such as a wet scrubber that requires gas to be fed into the scrubber at a minimum velocity for efficient operation is presented. A delivery duct feeds the gases from the incinerator to the cleaning device and a discharge duct conducts the gas from the cleaning device. A blower forces or induces the gas through the discharge duct. In order to maintain an efficient rate of flow of gas into the cleaning device, a recirculating duct has one end connected with the discharge duct on the downstream side of the blower and its other end connected with the delivery duct, and flow is proportioned between the recirculating duct and the delivery duct in accordance with variations in the velocity of the gas in the delivery duct so that the gas entering the cleaning device is maintained at an efficient rate of flow. The system further includes a temperature responsive modulating valve for controlling the flow of scrubbing liquid into the cleaning device in accordance with variations in the temperature of the gas exiting from the cleaning device so that the supply of water to the cleaning device can be reduced when the temperature drops and can be increased as necessary when the temperature of the gas increases, and thus maintain constant temperature and gas weight to the blower to prevent overload of the driving device. (Author abstract)

30836 **APTIC NO. 53208**

Ducasse, Viateur

EXCESS SMOKE ELIMINATING SYSTEM FOR BOILERS. *(Assignee not given.) U. S. Pat. 3,701,622. 5p., Oct. 31, 1972. 3 refs. (Appl. Nov. 23, 1970, 10 claims).*

A system which would eliminate excess smoke from boilers is described. The system detects excess smoke in the stack of an oil-fired industrial boiler and automatically reduces the oil supply to the burner of the boiler while the boiler is in continuous operation. The design of the system is presented. The photoelectric cell and light bulb in the smoke detector are mounted in the stack so that they will not become coated with soot and will not be affected by the heat of the gases. The system acts immediately upon detection of excess smoke, and thus eliminates excess smoke within 1 or 2 minutes. (Author abstract modified)

30837 **APTIC NO. 53353**

Eckert, George W.

SMOKE SUPPRESSANT FUEL COMPOSITION. *(Texaco, Inc., New York) U. S. Pat. 3,707,360. 3p., Dec. 26, 1972. 3 refs. (Appl. Dec. 7, 1970, 7 claims).*

A novel smoke suppressant fuel composition containing calcium compounds is described. Other smoke suppressants utilize barium compounds, but barium is toxic and creates a health hazard in the atmosphere. The fuel composition contains a calcium carbonate overbased calcium sulfonate, a calcium hydroxide overbased calcium sulfonate and a nitropropane. An important advantage of this fuel composition is that it gives a substantial reduction in smoke emission without adding materials of a toxic nature to the exhaust, and without causing any substantial loss in engine horsepower due to the use of the additive. The fuel composition retains its smoke suppressing properties for extended periods of engine operation. The fuel additive can be used in diesel, turbine, or jet engines which burn a middle distillate fuel in the kerosene boiling range.

30838 **APTIC NO. 53307**

Eichmeier, Joseph

AIR IONIZATION AND CLEANING ARRANGEMENT. *(Constantin Graf von Berckheim, Weinheim/Bergstrasse (West Germany)) U. S. Pat. 3,702,526. 7p., Nov. 14, 1972. 12 refs. (Appl. April 15, 1969, 7 claims).*

An arrangement by which the air within an enclosure is ionized and cleaned is described. A high voltage source applies a direct current potential across two electrodes. One electrode is suspended from the ceiling and the other electrode is supported by the floor of the enclosure. A radioactive substance is embedded within electrically insulating supporting members secured to the ceiling electrode. The radioactive substance ionizes the air within its proximity, and the ceiling electrode attracts the ions with valence opposite in sign to the potential of the ceiling electrode. The remaining ions are emitted within the space of the enclosure and serve to clean the air through removal of dust particles, and to further produce air with particularly desirable characteristics. This arrangement is applicable to air conditioning devices. By providing an electrode arrangement in conjunction with the conventional conditioning devices, it is possible to eliminate dust much more readily than with a conventional device which requires the arrangement of air circulators and separator filters. (Author abstract modified)

30839 **APTIC NO. 53340**

Farnworth, Wilfred

APPARATUS FOR REMOVING PARTICULATE MATERIAL FROM GASES. *(Rader Pneumatics Inc., Portland, Oreg.) U. S. Pat. 3,695,007. 4p., Oct. 3, 1972. 3 refs. (Appl. Aug. 14, 1970, 3 claims).*

An apparatus for removing particulate material from gases is presented. The device consists of a cyclone separator and tube filter mounted over the separator. Baffles are provided to direct air flow from the separator to the tube filter. The tube filter consists of long porous tubes suspended from the plate, the latter being divided into sections to facilitate the removal for repair of the tubes. The backwash for the tubes comprises a hollow arm to create air pulses in the tubes which are driven by a motor mounted in the well of the plate. Solids in the gas collect on the exterior of the tubes, so the tubes are periodically cleaned by blowing a jet of air into the open end of the tubes. (Author abstract)

30840 **APTIC NO. 53311**

Frew, Ronald

PARTICLE SEPARATOR *(Colonial Sugar Refining Co., Ltd., Sydney (Australia)) U. S. Pat. 3,702,527. 6p., Nov. 14, 1972. 9 refs (Appl July 20, 1970, 4 claims).*

A particle separator of improved efficiency in a duct conveying a gas stream is described. The separator is of the type having passages deflecting the gas stream one or more times and separating entrained liquid particles by impingement. According to the invention, the deflecting walls of the passages are formed by one or more substantially pointed corrugations, each corrugation being symmetrically shaped transversely and following its respective passage longitudinally. The particle separator of the invention is particularly suitable for reducing entrained sucrose losses in an evaporator of the type used in the manufacture of raw cane sugar, and in that application the particle separator has the additional advantage that separated liquid (aqueous sucrose) can fall back directly into the boiling liquid of the evaporator without the need to provide separate drainage means. (Author abstract)

30841 **APTIC NO. 53191**

Frey, Donald J. and Warren P. Opp

AUTOMATIC IGNITION SYSTEM FOR FLARING WASTE COMBUSTION GASES. *(Combustion Engineering, Inc., Windsor, Conn.) U. S. Pat. 3,697,229. 3p., Oct. 10, 1972. 5 refs. (Appl. Sept. 25, 1970, 3 claims).*

An automatic ignition system for flaring waste combustible gases exhausted through a stack is described. The system utilizes an ignitor burner which is automatically energized when the gases are passed to the stack. A main flame scanner, ignitor burner scanner, and a timer are interrelated so that a safe, economical, and efficient operation is performed. (Author abstract modified)

30842 **APTIC NO. 53206**

Gallo, Carl

POLLUTION CONTROL SYSTEM. *(American Pollution Control Corp., Scarsdale, N. Y.) U. S. Pat. 3,699,906. 7p., Oct. 24, 1972. 6 refs. (Appl. March 23, 1971, 2 claims).*

A pollution control system in which a continuous-wave radiofrequency generator is coupled to a radio-frequency power amplifier is described. The power amplifier is electrically coupled to an inductor surrounding a crucible made of sintered metal compounds or alloyed metals. The crucible is resistive to radio frequency currents and converts the electrical energy of the inductor into heat for converting matter within the crucible. This system can be used to control pollution from the treatment of commercial waste and sewage. Raw human waste can be reduced from its organic state to an inert inorganic state at the toilet bowl. The use of this system will reduce the need for incineration and water purification facilities, and thus air and water pollution. (Author abstract modified)

30843 **APTIC NO. 53305**

Gardenier, Hugh E.

PROCESS AND APPARATUS FOR CLEANING AND PUMPING CONTAMINATED INDUSTRIAL GASES. *(Aronetics, Inc., Tullahoma, Tenn.) U. S. Pat. 3,704,570. 11p., Dec. 5, 1972. 7 refs. (Appl. June 16, 1970, 18 claims).*

A process and apparatus for removing contaminants from a gas stream are described. The process comprises indirectly heat exchanging the gas and a liquid, introducing the liquid under conditions of elevated temperature and pressure in vaporized and atomized form to the gas, mixing the same and entrapping the contaminants, and separating clean gas from the atomized liquid containing the contaminants. In one embodiment, a water jacket surrounds the hot gas conduit and serves both to cool the hot gases and to preheat the cleaning liquid. Also disclosed is an auxiliary mechanism for heating the cleaning liquid before injection into the gas stream. The combustibles in the contaminated gases may be used for such heating. This process is particularly applicable for steel production and the refining of nonferrous metallic ores. (Author abstract modified)

30844 **APTIC NO. 53452**

Gertsen, Petr Petrovich and Taisia Georgievna Suvernaya

METHOD OF PURIFICATION OF EXHAUST GASES FROM NITRIC OXIDES. *(Permsky Politeknichesky Institut, Perm, U.S.S.R.) U. S. Pat. 3,695,828. 3p., Oct. 3, 1972. 3 refs. (Appl. April 14, 1970, 7 claims).*

A method for purifying exhaust gases from nitric oxides in the chemical industry is presented. The exhaust or waste gases are subjected to sorption with an alkaline reagent for removing higher oxides, then the gas is contacted with pyrite iron sulfide sprayed with water, in which case the basic portion of the nitric oxide is reduced to elementary nitrogen, after which the purified gas with residual nitric oxide is contacted with carbon monoxide so that the residual nitric oxide is reduced to elementary nitrogen. The method insures cleaning of the exhaust gases to a content of nitric oxides not higher than 0.02-0.05 vol%; it is simple and inexpensive and does not require the application of catalysts or a high consumption of energy; and provides a cheap and easily obtainable deoxidizer for the decomposition of nitric oxide. (Author abstract modified)

30845 **APTIC NO. 53314**

Gourdine, Meredith C. and Howard A. Sayers

ELECTROSTATIC PRECIPITATOR SYSTEM. *(Gourdine Systems, Inc., Livingston, N. J.) U. S. Pat. 3,704,572. 9p., Dec. 5, 1972. 14 refs. (Appl. May 15, 1970, 12 claims).*

An improved electrostatic precipitator device capable of significant size reduction is presented. The device has flat parallel plates consisting of an ionizing corona discharge portion as a unitary structure which is utilized to effectuate precipitation of entrained particles from an air stream onto the surface of a plurality of associated collection members, as an air stream containing entrained particles is cleaned in passing through the precipitator device. The ionizer discharge portion of the unitary structure comprises a plurality of substantially uniformly spaced apart sharp electrical conductive protrusions directed to alternate sides of the unitary structure. A uniform ionization region is formed with a parallel portion of the collector extending the full length of the ionizer. The remainder of each of the unitary structure functions as a passive electrode which cooperates with the remaining portion of the collector to form highly concentrated electrostatic fields for enhanced collection efficiency with minimum re-entrainment of the particles to be collected. (Author abstract)

30846 **APTIC NO. 53460**

Griffin, Lindsay I. and Albert B. Welty, Jr.

TWO STAGE AMMONIUM SULFATE DECOMPOSITION IN FLUE GAS DESULFURIZATION PROCESS. *(Esso Research and Engineering Co.) U. S. Pat. 3,695,829. 6p., Oct. 3, 1972. 7 refs. (Appl. June 1, 1970, 2 claims).*

A two-stage means for ammonium sulfate decomposition in a flue gas desulfurization process is presented. Buildup of sulfate ions in a flue gas desulfurization process employing an aqueous ammoniacal absorbent is prevented by reducing a portion of the sulfate to sulfur dioxide. Sulfur dioxide is removed from the flue gas by absorption in an aqueous solution of ammonium sulfite or ammonia. Some oxidation of tetravalent sulfur to hexavalent sulfur occurs. At least a portion of the absorber effluent solution is regenerated by acidification with ammonium bisulfate to liberate sulfur dioxide and to form an aqueous ammonium sulfate-ammonium bisulfate slurry. This slurry is decomposed in two stages. In the first stage, water is evaporated and the ammonium sulfate content is decomposed into ammonium bisulfate. A major portion of this ammonium bisulfate is returned to the acidifier. A minor portion, equivalent to the amount of sulfite oxidized to sulfate in the sulfur dioxide absorber plus the amount of sulfur trioxide in the entering flue gas, is decomposed into a completely gaseous product mixture comprising ammonia, nitrogen, and sulfur dioxide. The gaseous decomposition products from the two decomposition steps are used in the preparation of fresh aqueous absorbent solution. (Author abstract)

30847 **APTIC NO. 53289**

Hardison, Leslie C.

METHOD AND MEANS FOR TWO-STAGE CATALYTIC TREATING OF ENGINE EXHAUST GASES. *(Univer-*

sal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,701,823. 6p., Oct. 31, 1972. 5 refs. (Appl. Sept. 2, 1970, 8 claims).

A two-stage catalytic treatment of engine exhaust gases is described. The hot gas stream is passed without cooling and without added air through a first catalyst section effect reduction of nitrogen oxides. Air is then mixed with the resulting stream for passage through a second stage catalyst section to effect more complete oxidation of carbon monoxide and unburned hydrocarbons. A preferred apparatus is built to have the second catalyst stage along side of and in a heat exchange relationship with the first stage to assist in maintaining a high temperature first catalytic reduction section. The present invention provides an improved conversion system which reduces NOx more effectively as well as oxidizes CO. (Author abstract modified)

30848 **APTIC NO. 52634**

Hashimoto, Andrew Ginji

AMMONIA DESORPTION FROM CONCENTRATED CHICKEN MANURE SLURRIES. *Cornell Univ., Ithaca, N. Y., Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 236p., May 1972. 89 refs.*

The parameters which affect the rate of ammonia desorption from concentrated chicken manure slurries were investigated. The manure was diluted with distilled water to form a slurry which was further aerated to biologically convert organic nitrogen to ammonia. Desorption from ammonium chloride solutions was also studied. A first-order exponential equation was used to predict the desorption from solution. The acid ionization constant for ammonia varied for manure slurries, ammonium chloride solutions, and infinitely dilute anhydrous ammonia solutions. Ammonia transfer rate was affected by air currents and increased linearly with the aeration rate multiplied by the aeration coefficient. Approximately 80% of the total nitrogen from fresh chicken manure can be converted to ammonia, and at least 95% of the ammonia in manure slurries can be desorped from solution. (Author conclusions modified)

30849 **APTIC NO. 53267**

Head, Billy D., Edward A. Fraini, and George R. Martin

PROCESS AND CATALYST FOR REDUCING SULFUR IN HYDROCARBONS. *(Dow Chemical Co., Mildand, Mich.) U. S. Pat. 3,705,097. 2p., Dec. 5, 1972. 6 refs. (Appl. Jan. 28, 1971, 10 claims).*

The invention comprises a process and catalyst for reducing sulfur impurities in a crude hydrocaron stream by reacting, at a temperature of 450-525 C and a pressure of 300-4000 lbs/sq in. gage, the hydrocarbon stream with excess hydrogen in the presence of a fluidized catalyst having diameter of 5-1000 micron and comprising a mixture of magnesium oxide and a Group VIII metal oxide on a support of alumina, silica, or mixtures therof. The Group VIII metal content is 1-10% and the magnesium content is 5-25%, both based on the total weight of the catalyst. This process substantially reduces the sulfur content of hydrocarbons in crude feedstock.

30850 **APTIC NO. 52572**

Hokervall, Ebbe

EXPERIENCES WITH OPERATING SLUDGE DRYING FACILITIES. *(Praktiska erfarenheter fran drift av torkningsanlaggningar). Text in Swedish. Nordforsk Miljovardssekretariatet, Attonde Nordiska Symp. Vattenforskning, Skokloster, 1972, p. 147-161. (April 25-27.)*

Experiences gained with sewage sludge drying facilities in Sweden are presented. The malodorous components of sludge drying facilities can be practically quantitatively absorbed by cold water, e.g., in scrubbers, provided the sludge drying temperature is about 75 C. Odor nuisances can be further abated by the use of non-dehydrated sludge in the gas cleaning equipment or scrubber. Mercaptan emissions occur during the drying of sludges with high dry content, and during the incineration of dried sludge at temperatures below 700-800 C. Waste gases from communal waste incineration plants are used for sewage sludge drying in several sludge treatment plants in Sweden. The dried sludge can be incinerated together with communal waste in waste incinerator plants, the highest possible admixture rate being 50%.

30851 **APTIC NO. 53349**

Hollins, Jesse R.

VEHICLE ENGINE EMISSIONS CONTROL SYSTEM. *(Assignee not given.) U. S. Pat. 3,705,497. 10p., Dec. 12, 1972. 5 refs. (Appl. May 10, 1971, 14 claims).*

A system for directing the exhaust emissions of a vehicle internal combustion engine is described. The fumes from the crankcase are directed to the engine combustion chamber through the engine air intake when the vehicle is moving below a predetermined speed or is standing still with the engine running. When the vehicle is moving at/or above the predetermined speed, the crankcase fumes are directed to the ambient atmosphere. A treatment means is included, consisting of a wind tunnel which receives ram air and included a shutter at the outlet end against which ram air in the tunnel is directed. A conventional vacuum control valve is actuated by movement of the shutter. The valve connects a control conduit either to an engine affiliated source of negative (subatmospheric) pressure such as the intake manifold, or the atmosphere. Designs are presented.

30852 **APTIC NO. 53291**

Howick, Stanley O.

AIR WASHER. *(Assignee not given.) U. S. Pat. 3,702,048. 4p., Nov. 7, 1972. 2 refs. (Appl. March 10, 1971, 3 claims).*

An industrial air washer of the type which removes particulate matter from ventilating systems in polishing, plating, foundry, and other operations is described. The air washer has a vertical cylindrical housing partially filled with water and a tangential air entrance with an adjustable baffle plate controlling the inlet resistance. The air enters V-shaped baffles circularly arranged around an upwardly flowing water stream which is spread by an inverted conical distributor below a circular distributor plate. V-shaped moisture eliminators and a suction fan are disposed above the baffles. The present invention simplifies air washers and is thus more economical to fabricate. The water spray arrangement is more efficient, eliminating gaps which could possibly occur wwith the previous arrangement. (Author abstract modified)

30853 **APTIC NO. 53310**

Hunt, Elton B., Jr. and Karol L. Hujsak

METHOD FOR REDUCING SULFUR COMPOUNDS IN SULFUR PLANT EFFLUENT. *(Amoco Production Co., Tulsa, Okla.) U. S. Pat. 3,702,884. 3p., Nov. 14, 1972. 4 refs. (Appl. May 22, 1970, 3 claims).*

A method for reducing sulfur compounds in sulfur plant effluent is described. In the recovery of sulfur from sulfur dioxide and hydrogen sulfide-containing gases wherein the first of a series of reactors is operated under conventional Claus conditions, one or more of the remaining catalytic reactors in the sulfur plant can be operated at temperatures of the order from 250 to 400 F. Free sulfur is deposited on the catalyst. Regeneration of the catalyst is effected by heating a portion of the first reactor-condenser effluent to 500-700 F and flowing the resultant hot gas through the deactivated catalyst bed to vaporize free sulfur and regenerate the catalyst. Before placing the freshly regenerated catalyst bed back on the stream, it is cooled with unheated first reactor-condenser effluent to a temperature of 250-400 F. The cycle is then repeated. By this process the sulfur compounds discharged to the atmosphere can be decreased to a value of no more than 1 mol percent, permitting 99% or higher sulfur recovery. (Author abstract)

30854 **APTIC NO. 53211**

Isaacson, Boris

METHOD OF AND APPARATUS FOR TREATING A GAS TO REMOVE FOREIGN CONSTITUENTS THEREFROM. *(Assignee not given.) U. S. Pat. 3,701,235. 5p., Oct. 31, 1972. 4 refs. (Appl. Oct. 26, 1970, 6 claims).*

A method of and apparatus for treating a gas to remove foreign constituents from a gas is described. The process involves inducing flow of the gas through an inflatable treatment chamber constructed of a thin plastic film in such a way as to effect inflation of the chamber by gas pressure, washing, drying, and otherwise treating the gas during its flow through the chamber to remove the foreign constituents from the gas. Primary applications of the apparatus include the treatment of atmospheric air to remove dust, smog, fog, or other constituents. In the primary applications, the inflatable treatment chamber may be installed on level ground, on building tops, in natural or artificial ravines, such as washes or storm drains, or in natural or artificial tunnels, such as sewer tunnels having openings to the atmosphere. Design of the apparatus is presented. This invention overcomes the deficiencies of existing gas and air washing equipment stemming from the fact that existing equipment employs a rigid, heavy metal construction. The inflatable construction of the invention enables the washing chamber to be larger than conventional chambers, thus allowing a long gas residence time and high volumetric flow rates required for large scale gas purification. (Author abstract modified)

30855 **APTIC NO. 53201**

Johnson, Cecil J.

METHOD OF GASIFYING CARBONACEOUS MATERIALS TO A CARBON MONOXIDE FUEL GAS PRODUCT. *(Total Energy Corp., Columbia City, Ind.) U. S. Pat. 3,635,672. 6p., Jan. 18, 1972. 1 ref. (Appl. March 25, 1969, 9 claims).*

A method of gasifying coke, coal carbon, char, or other carbonaceous materials by passing a mixture of carbon dioxide, carbon monoxide, and oxygen or oxygen-containing gases through a bed of the carbonaceous materials is described. The temperature of the gasification process is regulated and maintained by adding additional carbon monoxide and oxygen or oxygen-containing gases at selected points in the process. The advantages of the process and the design of the apparatus are presented. (Author abstract modified)

30856 **APTIC NO. 52656**

Kauffmann, Joseph Chester, Sr.

INVESTIGATION OF THE INFLUENCE OF GASOLINE ENGINE INDUCTION SYSTEM PARAMETERS ON THE EXHAUST EMISSIONS. *Ohio State Univ., Columbus, Dept. of Mechanical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 269p. 38 refs.*

The influence of induction system parameters on engine exhausts was investigated. A 4-cylinder engine was used in the study, and two prototype manifole were designed and fabricated for performance testing. Nondispersive infrared gas analyzers measured the quantities of carbon monoxide, carbon dioxide, and nitric oxide in the exhaust stream while a flame ionization detector measured the hydrocarbon emissions. Four gasoline fuels were used having vapor pressures of 10.5, 12.9, 7.9 and 5.3 psi. The manifolds were operated with no inlet heat (cold) and with air preheat and compared with the stock manifold at speeds of 1400, 1800, 2200, and 2600 rpm. The air-fuel ratio was varied from 20:1 to 23:1 with the spark advance set at the manufacturer s specifications according to speed. A feasible approach to the design of intake manifolds is presented whereby the air and fuel distribution in a multicylinder engine is more uniform, making it possible to operate an engine at extremely lean air-fuel ratios, thus reducing emissions. The design of the manifolds is given and results of the testing discussed.

30857 **APTIC NO. 53296**

Keith, Carl D., John J. Mooney, and Louis J. Vanmansart

CATALYTIC EXHAUST GAS TREATMENT APPARATUS. *(Engelhard Minerals and Chemicals Corp., Newark, N. J.) U. S. Pat. 3,692,497. 6p., Sept. 19, 1972. 4 refs. (Appl. May 20, 1971, 11 claims).*

A catalytic apparatus for purifying gases, e.g., the exhaust gas of an internal combustion engine, is described, in which a unitary, catalytic element having gas flow paths is secured within a surrounding casing by at least one end flange, preferably two end flanges, a resilient, flexible member surrounding the catalytic element, and at least one surface projecting inwardly from the interior wall of the casing and in contact with the resilient, flexible member. Rotation of the catalyst is prevented by one or a plurality of such surfaces, preferably at least three. When using a plurality of these surfaces it is preferred that at least two or at least three be spaced-apart from each other by at least about 90 deg with respect to the center of the casing. Longitudinal movement of the catalyst is prevented by the flanges and further movement of this type can also be counteracted by providing a recess in the exterior surface of the catalytic element or an inwardly projecting surface on the interior wall of the casing, and in contact with the resilient, flexible member. (Author abstract)

30858 **APTIC NO. 53341**

Kemmetmueller, Roland

METHOD AND APPARATUS FOR POLLUTION-FREE CHARGING OF COKE OVENS. *(American Waagner-Biro Company, Inc., Pittsburgh, Pa.) U. S. Pat. 3,697,381. 8p., Oct. 10, 1972. 6 refs. (Appl. Feb. 7, 1972, 21 claims).*

A method and apparatus for carrying out pollution-free charging of coke ovens is presented. During introduction of a charge into a coke oven from a larry car, gas which escapes through the larry car connections to the coke oven is collected with a suitable gas-collecting pipe. Standpipes which communicate with the interior of the coke ovens communicate with a second gas-collecting pipe so that additional gas escaping from the interior of the coke ovens is collected. The entire space over the coke ovens is enclosed and the interior of the enclosure communicates with a third gas-collecting pipe in which gas is collected from the space over the coke ovens. All of this collected gas is cleaned before being discharged to the outer atmosphere. (Author abstract modified)

30859 **APTIC NO. 52630**

Kiang, Koh-don

KINETIC STUDIES OF SULFUR DIOXIDE ABSORPTION BY MANGANESE DIOXIDE. *Carnegie-Mellon Univ., Pittsburgh, Pa., Dept. of Chemical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 178p. 57 refs.*

Sulfur dioxide absorption from an SO2-nitrogen mixture by manganese dioxide was studied at 142-450 C with SO2 concentrations ranging within 0.1-1.0% by volume and sorbent particles of 5/16, 3/8, and 7/16 inch in diameter. The absorption rate, total pore volume, and specific surface area of a reacted particle decreased with the conversion level of oxide to sulfate. The maximum conversion was always less than 60%, and reaction was non-topochemical at both low and high temperatures. A model was constructed to describe the particle pore structure and the reaction kinetics. The agreement between the proposed model and the experimental data was satisfactory at 300-450 C, but poor at lower temperatures. (Author abstract modified)

30860 **APTIC NO. 53224**

King, Oliver F.

METHOD FOR IMPROVING FUEL COMBUSTION IN A FURNACE AND FOR REDUCING POLLUTANT EMISSIONS THEREFROM. *(Assignee not given.) U. S. Pat. 3,699,903. 5p., Oct. 24, 1972. 4 refs. (Appl. Feb. 25, 1971, 10 claims).*

A method for improving fuel combustion in furnaces and for reducing pollutant emissions from furnaces is described. Primary air is used solely for fuel feed, while commercially pure oxygen without any additives or other constituents is introduced for the combustion of the fuel in regulated amounts to provide sufficient oxygen for substantially complete combustion. The oxygen is preferably obtained by separating it from air so that the remaining nitrogen may be used as in inert gas applications. The resulting higher combustion temperatures give more complete combustion, higher stack temperatures, improved performance of the preheater and superheater sections of a typical boiler, and increased thermal efficiency. Pollution by nitrogen oxides is reduced. (Author abstract modified)

30861 **APTIC NO. 53023**

Klark, L. N. and N. I. Smirnov

RECOVERY OF EXHAUST GASES FROM VINYL CHLORIDE SYNTHESIS. *Sov. Chem. Ind. (English translation from Russian of: Khim. Prom.), 7(7):470-471, 1972. 9 refs.*

Dichloroethane, methanol, and methylpyrrolidone are investigated as solvents for extracting vinyl chloride and acetylene from the exhaust gases. Nitrogen containing vinyl chloride and acetylene in an amount corresponding to their concentration in the exhaust gases was passed through a solvent. Methylpyrrolidone was the most effective solvent. Under normal conditions the maximum acetylene content was 7%, and vinyl chloride 3%. When heated to 60-70 C, both hydrocarbons were easily desorbed from a saturated solution, with the desorption gases containing 41 vol% vinyl chloride and 58.6 vol% acetylene.

30862 **APTIC NO. 53449**

Kohayakawa, Takashi, Shinichi Yamamoto, and Michio Morimoto

ROTARY AFTERBURNER FOR INTERNAL COMBUSTION ENGINES. *(Daihatsu Kogyo Co., Ltd., Osaka (Japan)) U. S. Pat. 3,698,873. 4p., Oct. 17, 1972. 6 refs. (Appl. Jan. 25, 1971, 5 claims).*

A rotary afterburner for the combustion of noxious exhaust gases from an internal combustion engine is presented. The afterburner permits the conversion of noxious exhaust to harmless gases before being vented to the atmosphere, can be operated continuously and efficientyl, and serves to reduce the noise level usually emitted by exhaust gases as they leave the exhaust pipe. The device includes a rotary heat exchanger in the form of a honey-comb matrix located within a combustion chamber into which exhaust gases from the engine exhaust manifold are introduced after passing through one section of the rotating heat exchanger. The exhaust gases are burned in the combustion chamber, are passed through another section of the rotating heat exchanger, and are finally exhausted to the atmosphere through an exhaust pipe.

30863 **APTIC NO. 53304**

Koller, Hans and Urs Frey-Portner

CLEANING APPARATUS FOR THE OPERATION OF FILTER EQUIPMENT. *(Buss A. G., Basel (Switzerland)) U. S. Pat. 3,704,573. 4p., Dec. 5, 1972. 10 refs. (Appl. Sept. 8, 1970, 1 claim).*

A cleaning apparatus for the operation of filter equipment is described. The equipment contains a number of filter units of conventional design and is connected directly to process equipment, in which dust laden vapors are evolved under vacuum. Means are used to back wash, dry, and heat the individual filter bags during continuous operation. The back washing, drying, and heating is performed with superheated vapor having the same composition as the vapor evolved in the main process. After condensation, part of the vapor evolved in the main process may be diverted into an evaporator, superheated in the vapor phase, and then used for the back washing, drying, and heating. If lines are too long, resulting in vapor near the dew point, the effect of double expansion with partial condensation may be used to bring back the vapor to the superheated phase before backwashing a filter bag. The field application of this equipment relates to the filtration of dust-laden vapor which is evolved from thermally sensitive substances in a vacuum dryer or an extraction plant. The advantage of this equipment is a substantially shorter period of drying thermosensitive pharmaceuticals in a rotary vacuum dryer, than required in the same equipment with the bag filter operated in the conventional manner, during which considerable increase flow resistance through the filter bags gradully reduced the efficiency of the vacuum in the dryer. (Author abstract modified)

30864 **APTIC NO. 53476**

Kroll, Gert

PROCESS FOR CLEANING FILTER ELEMENTS OF FABRIC FILTER EQUIPMENT. *(Assignee not given.) U. S. Pat. 3,699,747. 5p., Oct. 24, 1972. 10 refs. (Appl. Sept. 8, 1969, 6 claims).*

A process and apparatus for cleaning the filter elements of fabric filter equipment are described. Some of the filter elements are recurrently shut off from the dust-laden air and are exposed to the action of a clean air current under relatively higher pressure. This causes the filter elements to move alternately in opposite directions. In comparison to other processes, this process and equipment are extraordinary simple to operate. The process is characterized by the diminishing of the wear of the fabric element, by being fully automatic, and by being adaptable to the most varied operating conditions. The apparatus includes intermittently a rotable value which causes the filter elements to be subjected to suction for short times and alternately to air under pressure for longer periods. (Author abstract modified)

30865 **APTIC NO. 52696**

Kropp, L. I. and A. I. Akbrut

WORKING PROCESSES AND CALCULATION OF THE EFFICIENCY OF A SCRUBBER WITH A VENTURI TUBE. *Thermal Eng. (English translation from Russian of: Teploenergetika), 19(7):63-68, 1972. 10 refs.*

The theoretical and experimental data for the efficiency of wet scrubbers are presented for substantial calculation and design of power plant stations. The overall ash efficiency of the plant is calculated. The mechanism of ash efficiency of collection by droplets with increase in size of particles can be explained by the fact that the velocities of large fractions of ash and of the gas flow differ considerably while fine particles move virtually at the speed of the gases. The results of the generalized processing of all experimental data in the form of the dependence of incomplete collection with respect to fractions in the venturi tube on dimensionless complex are given in semilogarithmic coordinates. Numerous tests of scrubbers with venturi tubes at power stations have shown the very good convergence of the actual ash collection efficiency with the collection efficiency calculated by the given procedure.

30866 **APTIC NO. 53212**

Kugler, Manfred, Gerd Muller, and Gunter Schwarz

VENTILATOR-COOLING TOWER FOR COOLING GASES AND LIQUIDS. *(Fried. Krupp Gesellschaft mit beschrankter Haftung, Essen (West Germany)) U. S. Pat. 3,637,193. 6p., Jan. 25, 1972. 4 refs. (Appl. July 2, 1970, 9 claims).*

A ventilator-cooling tower for cooling gases and liquids is described. The cooling tower is of the round type in which the supporting framework comprises a cable construciton and in which the bearing for the ventilator as well as a spacer ring within the region of the ventilator blades are firmly connected to a common shaft which forms a supporting element of the cooling tower construction. The airtight envelope for the cooling tower consist of a material, such as reinforced synthetics, impregnated canvas, wood, metal, or asbestos cement, and is supported and anchored by cable. The operation and design of the tower are presented. (Author abstract modified)

30867 **APTIC NO. 52961**

LaMasters, G. D.

FUEL INJECTION - ANOTHER TOOL FOR EMISSION CONTROL. *Preprint, Society of Automotive Engineers, Inc., New York, 5p., 1972. 1 ref. (Presented at the Society of Automotive Engineers, Mississippi Valley Section Meeting, Nov. 4, 1971, Paper 720679.)*

The advantages of electronic fuel injection over carburetors in minimizing exhaust emissions, improving performance, and maintaining a closed system to prevent gasoline evaporation and spillage during rollover are reviewed. System components including a throttle bypass air valve to increase engine air intake during idling, fuel supply pump, fuel injector nozzle, and pressure regulator are compared. Automatic control based on parameters such as engine speed, manifold pressure, air and coolant temperatures, and throttle setting and the advantages of fuel injection in permitting operation at lean (less than 18:1) air-fuel ratios, where carbon monoxide, hydrocarbon, and nitrogen oxide emissions are all low, eliminating the necessity for an exhaust reactor are reviewed.

30868 **APTIC NO. 53471**

Liebig, Preston D. and William B. Hurlbut, Sr.

ADJUSTABLE AIR POLLUTION CONTROL SCRUBBER BED. *(Combustion Engineering, Inc., Windsor, Conn.) U. S. Pat. 3,696,589. 4p., Oct. 10, 1972. 4 refs. (Appl. Oct. 22, 1970, 4 claims).*

An air pollution control system for controlling pollutants in gases resulting from combustion of fossil fuels is described. The control system has a scrubber housing and an overbed and underbed spraying apparatus within the housing. Unlike other systems, a multisectional scrubber bed is formed of standard size modules. Each module is supported within the scrubber housing for adjustment. The number of modules is dependent upon the preliminary design characteristics for the pollution control desired to be achieved for the particular combustion system. The adjustability within the scrubber of the beds enables the beds to be repositioned for particular flow characteristics of the gas being scrubbed. (Author abstract modified)

30869 **APTIC NO. 53202**

Lucas, Jean-Claude and Andre Madin

METHOD FOR FORMING A FILTER ELEMENT. *(Societe Industrielle de Filtration (Sofiltra), Paris (France)) U. S. Pat. 3,631,582. 18p., Jan. 4, 1972. 17 refs. (Appl. Feb. 8, 1968, 5 claims).*

A method and apparatus for forming a filter element especially useful for filtering noxious and radioactive gases are described. The element is composed of a ribbon of sheet filter material folded into reverse pleats. Bands or straps of flexible material are fixed to the crests of the folds in the sheet, at each side, and extend longitudinally in a laterally spaced relation. Transverse cuts are made in these strips at intervals regularly spaced along the pleated ribbon. Each cut is between two contiguous crests. The cuts made on one side are offset with respect to those on the other side. The pleated ribbon is then reversely folded at and along each line, to form a filter element of zigzag form. This element is then mounted within a casing having a passageway for the gas to be filtered, to obturate the passageway by sealing the end and side terminal of the element to the walls of the casing. The apparatus consists of a machine operating automatically to make the cuts. The pleated ribbon is moved in the direction of its length on and over a table. First and second rails extend transversely across the table, above and below it. Each rail carries a cutter assembly, which are spaced in the direction of travel of the ribbon. The assemblies move in unison and each makes a cut on its respective side of the ribbon to sever the bands along correctly spaced lines. At one surface of the ribbon, downstream of the cutters, means are provided to sense the cut previously made on that surface and to initiate a new cutting stroke. The cutters are moved in their return or idling stroke along the rails, out of contact with the bands and the ribbon. (Author abstract modified)

30870 **APTIC NO. 53351**

MacGuire, Andrew E.

VALVE DEVICE AND ANTI-POLLUTION SYSTEM EMPLOYING THE SAME. *(Ferry Cap and Set Screw Co., Cleveland, Ohio) U. S. Pat. 3,693,650. 7p., Sept. 26, 1972. 11 refs. (Appl. Aug. 12, 1970, 30 claims).*

A fluid pressure responsive valve device utilizing a valve member of elastomeric material, particularly adapted for employment in a supplemental air supply system to the manifold of an internal combustion engine is described. The provision of such a valve and system in the internal combustion engine will be effective in avoiding rough engine idle, back-firing, and unstable engine operation. It also ensures automatic adjustment to various throttle settings and rates of acceleration or deceleration which usually have resulted in a temporary improper fuel-air mixture. Excessive emissions of carbon monoxide and hydrocarbon vapors are eliminated.

30871 **APTIC NO. 52525**

Manwaring, L. G.

COARSE COAL CLEANING AT MONTEREY NO. 1 PREPARATION PLANT. *Mining Congr. J., 58(3):42-48, March 1972.*

The Monterey No. 1 plant incorporates several unique design and operating features. The facility produces clean coal for power generation purposes at a current rate of 3 million tons annually. Raw coal handling, preparation plant, loadout facilities, refuse handling, water clarification, refuse compaction, performance test, and distribution curves are described. To meet good environmental standards, all surface features of the operation including general layout, buildings, conveyers, refuse storage, reservoir construction, and site grading and finishing have been designed to be both functional and attractive.

30872 **APTIC NO. 52972**

Mathur, S. B., Narinder Singh, M. J. Shahani, and V. A. Altekar

RECOVERY OF MERCURY FROM EFFLUENTS. *Chem. Age India, 23(4):284- 290, April 1972. 44 refs.*

Available sources of mercury are discussed, along with the extraction of the pure metal from its ores and its removal and recovery from waste effluents. The only mercury metal of commercial significance is cinnebar, from which the metal is extracted via various pyrometallurgical or hydrometrallurgical techniques. Mercury can also be extracted from industrial gases with low sulfur dioxide concentrations by the following methods: absorption by pyrolusite; condensation of mercury vapors via a drop in temperature; the chlorine purification method, which is based on the strong affinity of mercury for chlorine; and the calcium hypochlorite method, in which a solution of calcium hypochlorite acts as a mercury sorbent. In the case of flue gases rich in sulfur dioxide, the gases can be sulfatized by concentrated sulfuric acid to yield mercuric sulfate; with this method, the SO2 in the gases is not affected. Mercury can be recovered from chlor-alkali wastes via precipitation with sodium hydrosulfide or ion exchange processes. The use of such recovery methods by Indian industrialists would be advantageous both in terms of reducing environmental pollution and the recovery of valuable mercury.

Work has been initiated at India's National Metallurgical Laboratory to recover mercury from smelter gases by using synthesized mercury containing gas mixtures as a base. The process being developed involves sulfatization to recovery mercuric sulfate from the gas.

30873 **APTIC NO. 53187**

McJones, Robert W.

METHOD AND SYSTEM FOR REDUCING OXIDES OF NITROGEN AND OTHER POLLUTANTS FROM INTERNAL COMBUSTION ENGINES. *(Assignee not given.) U. S. Pat. 3,650,255. 9p., March 21, 1972. 5 refs. (Appl. Sept. 17, 1969, 12 claims).*

A method and system for reducing nitrogen oxides and other pollutants from internal combustion engines is described. The nitrogen oxides in the exhaust gas emissions are reduced, as measured on a standard seven-mode driving cycle, by utilizing natural gas as a fuel and operating with an equivalence ratio from about 1.25 to 1.35. The 1.25 value corresponds to the maximum permissible amounts of NOx measured in ppm. The 1.35 value corresponds to the value where unacceptable power loss would result if exceeded. A gas-air mixture having a metering pin modified to operate with a natural gas inlet pressure of from -0.5 in. of water to +0.5 in. of water and within the specified range of equivalence ratios is employed. A modulator produces a fuel-rich condition at full throttle to increase power. (Author abstract modified)

30874 **APTIC NO. 53346**

Minkus, Herbert L.

ANTI-POLLUTION REGENERATIVE ENGINE. *(Assignee not given.) U. S. Pat. 3,693,351. 6p., Sept. 26, 1972. 5 refs. (Appl. Jan 29, 1971, 11 claims).*

An anti-pollution regenerative engine is presented wherein air motor cylinders are paired, with one cylinder having a greater volume than the other. Lever arms attached to two pistons in these cylinders have a length differential which compensates for the volume differential so that both pistons perform the same amount of work on a load device. Attached to a drive shaft for driving the load device is a tachometer which indicates when the load is applied or removed. When the tachometer indicates that the load has slackened, valves operate so that one of the cylinders ceases to act as a driving force and acts, instead, as a compressor, thereby returning air to a compressed air tank. Thus, during a slack load conditions, the compression cylinder stores energy to drive the system during high load conditions. (Author abstract modified)

30875 **APTIC NO. 53292**

Morris, Ewel J., Jr.

DEVICE FOR CLEANING POLLUTED AIR. *(Assignee not given.) U. S. Pat. 3,702,049. 5p., Nov. 7, 1972. 6 refs. (Appl. Sept. 24, 1970, 1 claim).*

A device for cleaning polluted air is presented. Decontaminant granules are anchored in adjacent surfaces of sheets extending alongside and spaced from each other. Deformations in adjacent surfaces receive adjacent portions of granules and retain outer portions of granules in air passageways between adjacent surfaces. The means are impvored for retaining the decontaminant granules in the path of air to be treated and at the same time a minimum of resistance to the air flow is created. The design of the apparatus and filter devices is given. (Author abstract)

30876 **APTIC NO. 53204**

Mullen, Hugh

MULTIPLE UNIT PRECIPITATOR APPARATUS. *(Buell Engineering Co., Inc., Lebanon, Pa.) U. S. Pat. 3,631,655. 6p., Jan. 4, 1972. 12 refs. (Appl. Jan. 2, 1970, 4 claims).*

A multiple unit precipitator apparatus is described. The apparatus for cleaning gases, such as industrial stack effluents and the like, comprises a plenum chamber for receiving and distributing the gases to be cleaned and a multiplicity of separately enclosed electrostatic precipitators connected in parallel with each other to the plenum chamber. The precipitators are arranged relative to the plenum chamber, and the plenum chamber is appropriately constructed to distribute the gas flow volume uniformly among the several precipitators and to provide improved cross section gas distribution conditions within each precipitator. Each of the precipitators may be individually isolated from the gas flow and its enclosure opened for maintenance or repair. The remaining precipitators pick up the cleaning load carried by the one or more that are shut down without substantial impairment of the effectiveness of cleaning. The system has balanced loading, and improved particle removal efficiency is thus obtained. (Author abstract modified)

30877 **APTIC NO. 53288**

Negra, John S. and Abe Warshaw

PROCESS AND CATALYST FOR TREATING COMBUSTION EXHAUST GAS. *(Chemical Construction Corp., New York) U. S. Pat. 3,701,822. 3p., Oct. 31, 1972. 7 refs. (Appl. June 11, 1970, 3 claims).*

A process and catalyst for treating combustion exhaust gas is described. The exhaust gas from internal combustion engines is treated to convert harmful or pollutant components such as nitrogen oxides, carbon monoxide, and unburned hydrocarbons to innocuous compounds, by contacting the exhaust gas with a catalyst composition containing nickel, cobalt, and manganese in catalytically effective amounts, deposited on a carrier such as alpha alumina. The synergistic combination of nickel, cobalt and manganese deposited on a carrier is considered to be a more effective catalytic agent. Nitrogen oxides are reduced to nitrogen and carbon monoxide and hydrocarbons are oxidized to carbon dioxide and water vapor. The manganese will generally be present as manganese oxide, however, the nickel and cobalt may at least be partially present as reduced oxides or in the metallic state. (Author abstract modified)

30878 **APTIC NO. 53335**

Neumann, Gerhard

ROLLER STRIP FILTER FOR PURIFYING AIR OR GASES. *(Delbag- Luftfilter Gesellschaft mit beschrankter Haftung, Berlin (Germany)) U. S. Pat. 3,695,008. 15p., Oct. 3, 1972. 6 refs. (Appl. Jan. 15, 1970, 23 claims).*

A roller-strip filter for air or gas purification in air conditioning systems is presented. It can be easily dissembled, and consists of two units separable from each other. The first unit comprises a mounting framework, seals for the filter strip, support grids for backing the filter strip, and guide rollers for the filter strip. The second unit comprises feed and wind-up rollers for moving the filter strip and a drive unit for rotating the wind-up roller, by which the more delicate components can be mounted in the filter framework after fitting the framework to a wall portion. Advantages of the invention include inexpensive construction and universal applicability. It can be fitted into a wall opening in various assembly stages along with its mounting framework without danger of damaging or dirtying the important functional components of the filter. Designs are included.

30879 **APTIC NO. 53481**

Nicklin, Thomas

TREATMENT OF GASES. *(Gas Council, London (England)) U. S. Pat. 3,704,095. 6p., Nov. 28, 1972. 7 refs. (Appl. Feb. 2, 1971, 8 claims).*

An absorbing composition suitable for use in removing sulfur oxides from gases such as flue gas is described. The composition essentially comprises: an oxide of uranium and/or a precursor; an oxide of thorium and/or a precursor; and an alkali metal or alkaline earth metal oxide and/or a precursor. The preferred alkali metal or alkaline earth metal oxide is sodium or lithium oxide and it is preferred that the composition is disposed on a carrier such as alpha-alumina. The composition may be regenerated after use by exposure to a hydrogen containing gas at a temperature of 670 to 680 degrees C. (Author abstract modified)

30880 **APTIC NO. 53450**

Osteen, Mitchell M.

AIR FILTER DEVICE. *(Assignee not given.) U. S. Pat. 3,695,009. 8p., Oct. 3, 1972. 14 refs. (Appl. March 30, 1970, 3 claims).*

An air-purifying device for a sealed optical enclosure of a luminaire is presented. The device consists of a coherent mass of activated charcoal particles contained in a rigid holder. The device has a plurality of recesses in its surface to increase the filter surface area, lower its air flow resistance, and reduce the amount of contaminant deposited thereon. The filter device is arranged in an enclosure formed by separable connecting parts of the luminaire in communication with the sealed optical enclosure. The air-permeable filter device permits a higher level of illumination from the luminaire for a longer period of time. The device is shielded from direct exposure to dust and the high temperature and radiation of the luminaire lamp. Designs are given.

30881 **APTIC NO. 53243**

Palmgren, Soren and Heimo Zinko

CHEAPER ELECTRICITY AND REDUCED ENVIRONMENTAL DAMAGE BY MEANS OF MHD-GENERATORS. *(Billigare elkraft, mindre miljoskada med MHD-generator). Text in Swedish. Tek. Tidskr., 102(3):32-40, Feb. 1972. 2 refs.*

The principle, design, economy, and environmental aspects of magnetohydrodynamic generators are described. Combustion type magnetohydrodynamic (MHD) generators, of which prototypes are already known, use fossil fuels such as natural gas, oil, coal, kerosene, or alcohol, and toluene to reach a temperature of 2600 K. Inert gas-alkali type magnetohydrodynamic generators continue to be in an experimental stage. Nuclear MHD generators are being studied in the U. S. Magnetohydrodynamic generators deliver cheaper energy than conventional power plants do, and create less serious environmental problems. For combustion type magnetohydrodynamic generators, combinations of expensive flue gas cleaners with chemical units for the recovery of waste products, such as nitrogen and sulfur oxides, are proposed. The high efficiency inherent in magnetohydrodynamic generators results in reduced waste heat amounts, and thus in reduced thermal pollution.

30882 **APTIC NO. 53293**

Panhard, Jean

POST-COMBUSTION DEVICES FOR INTERNAL COMBUSTION ENGINES. *(Societe de Construction Mecaniques Panhard et Levassor, Paris (France)) U. S. Pat. 3,704,592. 9p., Dec. 5, 1972. 8 refs. (Appl. July 16, 1970, 10 claims).*

Post-combustion devices for burning combustible gases in the exhaust gases of internal combustion engines are described. The equipment comprises a post-combustion chamber bounded by a casing and connected to the eingine exhaust pipe, a blower driven by the engine for sending additional air into the post-combustion chamber, and a heat-exchanger for pre-heating the additional air by the exhaust gases from the post-combustion chamber. The post-combustion chamber and the heat-exchanger are constituted by three co-axial cyclinders, the assembly being arranged so that the exhaust gases are introduced into the axis and at the center of the post-combustion chamber, the outer cylinder and the intermediate cylinder defining a peripheral zone in which the additional air circulates. The intermediate cylinder and the inner cylinder define an intermediate zone in which the exhaust gases from the combustion chamber circulate countercurrently to the additional air. The device is useful for two-stroke, four-stroke, and rotary piston engines. These devices are efficient enough to obviate the necessity of using spark plugs. (Author abstract)

30883 **APTIC NO. 53477**

Paraskos, John A. and Allen E. Somers

HYDRODESULFURIZATION OF CRUDE AND RESIDUAL OILS AT REDUCED SPACE VELOCITY. *(Gulf Research and Development Co., Pittsburgh, Pa.) U. S. Pat. 3,706,657. 7p., Dec. 19, 1972. 2 refs. (Appl. Dec. 31, 1970, 18 claims).*

A process for the hydrodesulfurization (HDS) of crude and residual oils at reduced space velocity is described. The oil and hydrogen are passed over a catalyst with the HDS catalyst cycle limited by the maximum temperature that the reactor metals can withstand at the process pressure. As the hydrodesulfurization proceeds, metals from the feed oil are deposited on the catalyst until maximum possible metals loading on the catalyst is reached. As the process proceeds, a continual temperature rise is required to achieve the required sulfur removal until the maximum or constraint temperature is reached. By maintaining the space velocity at a sufficiently low value the catalyst experiences maximum metals loading before the constraint temperature is reached so that full catalyst life is utilized. Although nickel-cobalt-molybdenum is a preferred active metal combination for the HDS catalyst, other combinations can be utilized, such as cobalt molybdenum, nickel tungsten, and nickel molybdenum. Alumina is a preferred supporting material, but other noncracking supports can also be used. The total production or throughput achieved by the present process surpasses that of conventional HDS processes by a marked degree. (Author abstract modified)

30884 **APTIC NO. 53447**

Paucha, Gene

FILTER APPARATUS WITH REMOVABLE FILTER ELEMENTS. *(Farr Co., El Segundo, Calif.) U. S. Pat. 3,693,328. 8p., Sept. 26, 1972. 12 refs. (Appl. May 4, 1970, 8 claims).*

A removable filter dust separating apparatus which removes the dust or other foreign particles from air or other gaseous fluids at relatively high rates by means of inertial separation action is presented. The invention provides for an inertial type filtering device which includes a plurality of parallel units each having a pair of filter elements which are individually removable and replaceable and which are rigidly supported within the housing of the apparatus in a vertically spaced and converging relationship. Each pair of filter elements are held in place by converging upper and lower horizontal rails of sufficient strength and rigidity to properly support the elements in the housing. Each filter element is secured to the housing by a locking mechanism which avoids interference with the filtering operation of the apparatus and which is easily accessible to a workman.

30885 **APTIC NO. 53445**

Perga, Martin W. and Ted V. De Palma

SELF-CLEANING CATALYTIC CONVERTER. *(Assignee not given.) U. S. Pat. 3,695,850. 4p., Oct. 3, 1972. 6 refs. (Appl. Aug. 31, 1970, 4 claims).*

A self-cleaning catalytic converter for conversion of soot-laden exhaust gases is presented. The converter has a catalyst retaining section with catalyst material therin. Adjacent flow zones are established through the catalyst material, with each flow zone having a different flow resistance than the adjacent one. Thus, the mass flow velocity through one flow zone will be greater than through an adjacent one. The catalyst material is packed loosely which permits movement of the catalyst material. As the pressure drop increases in some flow zones from soot deposition, the catalyst material will move from each flow zone to an adjacent flow zone thus permitting more efficient conversion of the soot within the exhaust gases. The catalytic converter is applicable to the treatment of exhaust gases emitted from internal combustion engines. Designs of the converter are given. (Author abstract)

30886 **APTIC NO. 53478**

Peterson, Oliver H.

METHOD OF CONTROLLING ODOR. *(Salsbury Labs., Charles City, Iowa) U. S. Pat. 3,706,663. 4p., Dec. 19, 1972. 6 refs. (Appl. Feb. 25, 1971, 12 claims).*

A method of controlling the odors emanating from large bodies of animal waste such as are found in feedlots and in the sumps of animal houses is described. The animal waste is treated with a compound capable of selectively inhibiting the formation of malodorous compounds which normally result from the natural decomposition of the animal waste. Preferred compounds are the sulfa drugs and sulfaguanidine, which is particularly useful. The compound is typically applied as a solid mixed with an inert diluent when used on a feedlot, and as an acid solution when used to treat the sewage in the sump of an animal house. This is the only chemical method available to eliminate or minimize animal waste odor. (Author abstract modified)

30887 **APTIC NO. 53538**

Phillips, Geoffrey and Robert G. Flagg

TECHNIQUES IN AIR POLLUTION CONTROL FOR THE CONVERTING INDUSTRIES. *Mod. Converter, 16(2):30-33, Dec. 1972.*

Existing pollution control regulations that apply to web printers are summarized together with prospective future controls. The air pollution problem in web plants is associated with the ink-dryer system in the press; it can be minimized by use of few solvents, by the use of odorless, smokeless, and thermo setting inks, and by restricting the quantity of pollutants and the volume of exhaust from the dryer (e.g., through periodic cleaning of equipment, use of low web temperatures, and decreasing unnecessary inflow of fresh air). Pollution control equipment should meet all existing codes, not upset dryer operating characteristics and web balance, and operate on available fuels. The equipment includes straight afterburners, which are expensive to operate; afterburners with heat exchangers, which can halve pollution control gas bills and pay for themselves in one year; and catalytic afterburners, which are not acceptable to all air pollution boards. Ultraviolet inks may ultimately be the best answer to pollution control: when exposed to the proper UV intensities, these inks turn to a solid without any emissions. However, their costs remain substantially higher than conventional inks.

30888 **APTIC NO. 52987**

Pischinger, Rudolf and Wolfgang Cartellieri

COMBUSTION SYSTEM PARAMETERS AND THEIR EFFECT UPON DIESEL ENGINE EXHAUST EMISSIONS. *Preprint, Society of Automotive Engineers, Inc., New York, 13p., 1972. 11 refs. (Presented at the Society of Automotive Engineers, National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., Sept. 11-14, 1972, Paper 720756.)*

Experiments carried out with two single-cylinder direct-injection engines and two identical precombustion-chamber engines showed that direct injection is the more promising combustion system for low-emission commercial automotive diesel engines, particularly when turbocharged and aftercooled, and that this type of engine can satisfy the 1975 California standards. The possibilities for reducing exhaust emissions by use of catalytic converters, exhaust recirculation, and LPG dual-fuel operation are also discussed; exhaust recirculation is the only promising method, and it can be effectively applied only in the low-load range of engine operation.

30889 **APTIC NO. 53330**

Prahacs, Steven and Satya Pal Bhatta

METHOD OF REMOVING ODORIFEROUS SULPHUR COMPOUNDS FROM VAPOURS OR GAS STREAMS. *(Pulp and Paper Research Inst. of Canada (Quebec)) U. S. Pat. 3,701,824. 12p., Oct. 31, 1972. 8 refs. (Appl. Oct. 2, 1970, 26 claims).*

A method of removing odoriferous sulfur compounds from vapors or gas streams resulting from any industrial process, where at least one of the components in a gas stream is hydrogen sulfide, organic sulfur compounds such as methyl mercaptan or dimethyl sulfide, or carbon disulfide, is described. The odoriferous sulfurous gases are removed from a gaseous stream by intimately contacting the stream with an aqueous alkaline suspension of activated carbon having a pH of at least about 8 in the presence of at least 12% by volume carbon dioxide and not more than about 6% by volume oxygen. The activated carbon promotes the oxidation of sulfide ions and methyl mercaptan. The invention relates to the reduction in the emission of the odoriferous compounds originating from kraft pulp mills specifically from recovery furnaces, lime kilns, smelt tanks, blow tanks, digester relief systems, pulp washers, and from black liquor evaporators in kraft mills. The invention provides a treatment process for the high efficiency removal of odoriferous compounds from a gaseous stream in a single absorption step. The process is exceptionally efficient in removing any combination of the above mentioned compounds by the use of a treating agent which may be obtained as a by-product of the main process at a very economical cost if it is produced and used at the same kraft pulp mill. (Author abstract modified)

30890 **APTIC NO. 53198**

Reed, Robert D.

BURNER ASSEMBLY FOR FLARE STACK. *(John Zink Co., Tulsa, Okla.) U. S. Pat. 3,697,231. 4p., Oct. 10, 1972. 5 refs. (Appl. Dec. 23, 1970, 10 claims).*

A burner assembly for the upper end of a flare stack is described. The assembly was designed for the combustion of gases at significant elevations above the surrounding terrain. A smoke suppressant is thoroughly mixed with the gas prior to the burning reactions, while a structural arrangement enables the distribution of the smoke suppressant in volumes proportional to the quantity of the gases to be burned. (Author abstract)

30891 **APTIC NO. 53213**

Reichhelm, Robert

ANTI-POLLUTION AFTERBURNER. *(Assignee not given.) U. S. Pat. 3,650,111. 6p., March 21, 1972. 6 refs. (Appl. Feb. 16, 1970, 11 claims).*

An anti-pollution afterburner and a method for transforming the carbon particles and/or carbon monoxide found in exhaust gases into carbon dioxide are described. This is attained by providing an afterburner adjacent to an exhaust stack and utilizing a liquid fuel which has been transformed into a substantially gaseous state mixed with excess combustion air prior to ignition. The hot products of combustion thus generated by the afterburner are mingled with the exhaust products flowing through the stack whereby the heat and excess air of the generated hot gases effect the combustion of the carbon particles and/or the transformation of the carbon monoxide constituent to carbon dioxide. The design of the afterburner is presented. This afterburner can be used at any combustion source including industries, automobiles, and diesel engines. (Author abstract modified)

30892 APTIC NO. 53459

Richmond, Charles A.

GAS SCRUBBING SYSTEM. *(Nichols Engineering and Research Corp., New York) U. S. Pat. 3,696,590. 11p., Oct. 10, 1972. 26 refs. (Appl. Aug. 14, 1969, 8 claims).*

A gas scrubbing system that removes particulate matter and other foreign substances from suspension in gases is described. The gases are subjected to high velocities and sudden changes in their direction of movement. This forces the heavier particles against various surfaces from which they are washed or sprayed. The system consists of a flat surfaced tapered input quencher sealed to an entrance duct via a water seal arrangement which includes a weir arrangement to control a flow of flushing water, an elbowed connector having flat internal surfaces, a spin damper with upper and lower finite clearances, and a cyclonic scrubber with supplemental tangential air inlets at the spin damper level, doughnut and disc shaped baffle plates semitangentially oriented gas outlet, and individually supplied water spray nozzles. Both the cyclone type gas scrubbing device and the gas feed arrangements for the device are novel. The system is particularly useful for cleaning hot exhaust gases from combustion. (Author abstract modified)

30893 APTIC NO. 53484

Rosa, Juan

ANTISMOG DEVICE FOR CLEANING, BURNING AND MUFFLING THE EXHAUST GASES AND ENGINE COMPARTMENT FUMES OF INTERNAL COMBUSTION ENGINES. *(Assignee not given.) U. S. Pat. 3,696,619. 7p., Oct. 10, 1972. 7 refs. (Appl. July 23, 1970, 9 claims).*

An antismog device for cleaning and muffling exhaust gases and engine compartment vapors of internal combustion engines is described. It consists of a fume collecting funnel and a casing connected with the exhaust pipes of the engines. The casing is arrayed externally with a fluid level indicator, necessary inlet, outlet, and conducting tubing and with an afterburning ignition device connected with the interior of the casing. The internal structure mainly consists of a funnel shaped chamber connected at the narrow end to a perforated tube with a return elbow and faced by a multibladed impeller. A chamber partially surrounds the perforated tube and is filled with copper shavings. The casing is filled with an ammonia cuprous chloride solution. The gases from the engine are washed and stripped of the carbonaceous residual particles, purified by means of their contact with the liquid charge contained in the casing, and expelled to the atmosphere due to their own expansion, without producing noise. Other devices are only partially effective or else they are complicated in their design, expensive to manufacture, and most of them cannot be readily serviced to replace or replenish chemical fluids and catalysts. (Author abstract modified)

30894 APTIC NO. 53210

Rotsky, Bernard A. and Gilbert M. Dunne, Jr.

MODULARIZED ELECTROSTATIC PRECIPITATOR. *(Gourdine Systems, Inc., Livingston, N. J.) U. S. Pat. 3,701,236. 15p., Oct. 31, 1972. 3 refs. (Appl. Dec. 1, 1970, 32 claims).*

A self-contained electrostatic precipitator module adapted to be inserted into and removed from a housing as a unitary assembly is described. The unit includes a slatted, endless belt defining a composite attractor electrode-collector electrode assembly, a forced air system for cooling and cleaning electrode holder structures, a power supply for establishing the charging and precipitating fields, a drive motor and train and mounting system for moving the endless belt, and rotary brushes at a remote location for neutralizing and cleaning the belt. The belt slats are flat, rigid members of simplified design and are individually mounted to allow selective replacement of a local belt section. Insulating gaps of optimized configurations are provided around high potential electrode holders to prevent electrical shorting or sparking. Increased capacity is readily obtainable by employing plural units arranged in parallel within a common housing. (Author abstract modified)

30895 APTIC NO. 53473

Ruse, Alois

GAS ANALYZER AND MIST SEPARATOR. *(Hartmann and Braun A. G., Frankfurt (West Germany)) U. S. Pat. 3,698,159. 4p., Oct. 17, 1972. 11 refs. (Appl. Sept. 11, 1968, 1 claim).*

A device for gas analysis where sulfur trioxide mist droplets are entrained and are separated from a sample gas stream before the gas enters an analyzer is described. The separating device is characterized by the novel feature wherein the gas sample stream is led into a capillary member having a closed end terminating an entrance capillary constriction and having exit capillaries axially perpendicular to it. In order to separate out gaseous SO3, the sample gas stream is dosed with an equivalent amount of water or water vapor before its entrance into the separating device, so that the gaseous SO3 is completely converted to SO3 or sulfuric acid droplets. This process permits the simultaneous determination of SO3 content in the gas sample stream by making a concentration measurement by, e.g., a conductivity measurement of the H2SO4 separating out. (Author abstract modified)

30896 APTIC NO. 52539

Sakata, Norihiko and John W. Prados

THE DYNAMICS OF A PACKED GAS ABSORBER BY THE PULSE RESPONSE TECHNIQUE. *Am. Inst. Chem. Engrs. J., 18(3):572-581, May 1972. 17 refs.*

The dynamic response of a packed gas absorber to inlet gas composition changes was investigated by the pulse response technique for the case where absorption was accompanied by pseudo first-order irreversible chemical reaction. The solute-carrier-solvent system was carbon dioxide-air-0.07 normal aqueous sodium hydroxide solution. The column used was 6.5 in. I.D. Plexiglass packed to a height of 6.15 ft with either 1/4 inch Raschig rings or 3/4-inch Berl Saddles. Gas flow rates ranged from 1.5 to 10 lb-moles/hr/sq ft and liquid flow rates ranged from 0 to 200 lb-moles/hr/sq ft. A pulse of CO2 was injected into the inlet air stream and monitored as it entered the packed section. The outlet gas and liquid phase concentrations were continuously monitored as the resulting pulses left the packed section. The pulse response data were reduced to frequency response by digital computer calculations. Reliable data could be obtained over the frequency range 0 to 5 radians/sec. The experimental results were compared with theoretical predictions from the slug flow, axial diffusion, and mixing cell models. Both the mixing cell model and the axial diffusion model satisfactorily predicted the experimental frequency responses over the entire frequency range covered. The slug flow model was unsatisfactory for predicting gas-phase amplitude ratios at high frequencies, where axial mixing affected the amplitude ratios. Gas-phase particle Peclet numbers and overall mass transfer coefficients based on the gas-phase driving force determined in the present absorption system were in reasonable agreement with the values reported in the literature. (Author abstract)

30897 APTIC NO. 53312

Santiago, Andres and Enrique Santiago

APPARATUS FOR THE DETOXIFICATION OF EXHAUST GASES OF INTERNAL COMBUSTION ENGINES. *(Zeuna-Staerker, K. G., Augsburg (West Germany)) U. S. Pat. 3,703,082. 8p., Nov. 21, 1972. 3 refs. (Appl. Sept. 13, 1971, 18 claims).*

An afterburner apparatus for the detoxification of exhaust gases from internal combustion engines is described. The device has an inner combustion chamber totally enclosed in an outer, heat insulated combustion chamber. Some of the exhaust gas conduits form the engine exhaust directly into the outer chamber, while other exhaust gas conduits pass through the outer chamber and are exhausted into the inner chamber. The afterburner device provides for the efficient purifying of exhaust gases and permits the separate guiding or piping of several exhaust gas currents. The structural components of the afterburner are arranged to make it especially suitable and efficient with regard to thermal and flow considerations. (Author abstract modified)

30898 **APTIC NO. 53483**

Sargent, Ray

ANTI-POLLUTION APPARATUS. *(Assignee not given.) U. S. Pat. 3,706,182. 3p., Dec. 19, 1972. 3 refs. (Appl. Dec. 2, 1970, 4 claims).*

An antipollution device for insulation in factory smoke stacks is described. This device includes a charcoal filter through which the smoke is pulled by fan blades. The filter removes the toxic gases and smoke particles. The smoke is treated before it passes through the charcoal filter by electrodes from which a high voltage spark is produced from point to point by means of a distributor which causes the electrodes to fire alternately. (Author abstract modified)

30899 **APTIC NO. 53345**

Scheinberg, Israel Herbert

FILTERS AND CARBON MONOXIDE INDICATORS. *(Assignee not given.) U. S. Pat. 3,693,327. 8p., Sept. 26, 1972. 7 refs. (Appl. Dec. 30, 1970, 39 claims).*

A filter is presented wherein the filter medium is selected from the group consisting of amorphous hemoglobin, crystalline hemoglobin, amorphous heme and crystalline heme in the presence of a stoichiometric excess, with regard to the iron in said hemoglobin or heme, of a suitable reductant. The filter is adapted to remove carbon monoxide from air or the gases inhaled by a smoker. The filter medium assumes a predetermined color and infrared absorptivity characteristic when exposed to a predetermined quantity of carbon monoxide. Support for the filter medium may be provided with windows for visual access to the filter medium automatic means may be provided for replacing the filter medium in response to detection of color or infrared characteristics. Hemoglobin or heme in the presence of a suitable reductant may also serve as a carbon monoxide detector. (Author abstract modified)

30900 **APTIC NO. 53203**

Schindling, Josef and Hermann Mueller

CENTRIFUGAL DUST COLLECTOR FOR THE WASTE GASES OF A SINTER MACHINE FOR ORES, BUILDING MATERIALS AND THE LIKE. *(Metallgesellschaft Aktiengesellschaft, Frankfurt (West Germany)) U. S. Pat. 3,635,003. 6p., Jan. 18, 1972. 6 refs. (Appl. Aug. 18, 1969, 3 claims).*

A centrifugal dust collector for the waste gases from a sinter machine for ores, building materials, and the like is described. Dust-laden gases are drawn into a series of hoppers beneath the grate of a sintering machine and then are passed into a centrifugal dust collector which extends along at least one side of the sintering machine. The invention overcomes the disadvantages of previous dust collectors by special construction. The disadvantages caused by different pressure losses of the cells in the rear compared with the cells in the front causing lowered collection efficiency are eliminated by having a wider raw gas inlet so that only a few collecting cells have to be arranged in the depth. (Author abstract modified)

30901 **APTIC NO. 53347**

Smith, Donald E.

METHOD TO PREVENT TOXIC GAS EMISSION. *(Dept. of the Army, Washington, D. C.) U. S. Pat. 3,705,474. 4p., Dec. 12, 1972. 2 refs. (Appl. Jan. 21, 1971, 2 claims).*

A method of containing, shipping, storing, and handling objects to prevent moisture from entering a storage container and to prevent toxic gas emission from the container is presented. The method utilizes a barrier shipping and storage container for a racket system warhead section containing conventional GB toxic agent. The barrier container prevents escape of toxic agent to the environment and avoids a toxic agent contamination hazard. It also assures safety in handling, shipping, and storing a warhead section containing toxic agent. Designs are given.

30902 **APTIC NO. 53209**

Smuck, Harry A.

SMOKE ELIMINATOR. *(Assignee not given.) U. S. Pat. 3,701,237. 4p., Oct. 31, 1972. 4 refs. (Appl. March 10, 1972, 1 claim).*

A gas scrubber and purifier for the exhaust gases from incinerators and furnaces is described. The exhaust gases are forcibly passed through water curtains. Sprays are produced by revolving discs which throw water by centrifugal force. The exhaust gases are passed through this, and any fine solid matter such as dust and fly ash are captured. Any soluble gaseous ingredients in the exhaust gases are dissolved in the process. Designs of the scrubber and process are given. The device is simple in construction, reliable in operation, and requires a minimum of maintenance. (Author abstract modified)

30903 **APTIC NO. 53328**

Snoek, Jacobus and Jaap E. Naber

METHOD FOR CONTROLLING A SULFUR RECOVERY PROCESS. *(Shell Oil Company, New York) U. S. Pat. 3,692,480. 5p., Sept. 19, 1972. 4 refs. (Appl. May 19, 1971, 7 claims).*

A sulfur recovery process based on the reaction of hydrogen sulfide with sulfur dioxide is presented wherein at least part of the sulfur dioxide is derived from the regeneration with a reducing gas of a loaded solid acceptor used in flue gas desulfurization. The process is controlled by measuring the difference between the volume of reducing gas used in regeneration and the volume of off-gas obtained from regeneration and employing this difference to control, either directly or indirectly, the composition of the gas mixture to the sulfur recovery process. The preferred molar ratio between hydrogen sulfide and sulfur dioxide in the gas mixture for sulfur recovery is approximately equal to two, the stoichiometric ratio in the above-mentioned reaction. The molar ratio is chosen so as to be larger than two in some cases to permit an excess of hydrogen sulfide. This is of importance when the gases leaving the sulfur recovery reactor are incinerated in order that a flame temperature can be reached that is sufficiently high for hydrogen sulfide to be burned completely. This, however, will also permit the production of some sulfur dioxide, an event which does not occur when the aforementioned molar ratio is two. (Author abstract modified)

30904 **APTIC NO. 53193**

Soria, Alberto Olague and Avelino Martinez Sanchez

METHOD AND APPARATUS FOR PURIFYING EXHAUST GASES. *(Assignee not given.) U. S. Pat. 3,648,435. 5p., March 14, 1972. 6 refs. (Appl. March 9, 1970, 7 claims.)*

A method and apparatus for purifying exhaust gases generated by the combustion of fuels is described. The gases are passed through a chamber for extraction of the impurities and noxious materials by an absorber liquid. The design and operation of the apparatus are presented. (Author abstract)

30905 **APTIC NO. 53017**

Stecher, P. G.

HYDROGEN SULFIDE REMOVAL PROCESSES. *Noyes Data Corp., Park Ridge, N. J., Pollution Control Review 5, 294p., 1972.*

Information on hydrogen sulfide removal processes based on U. S. patents since 1960 is reviewed. The H2S can be removed from gases by absorption by inorganic compound solutions and suspensions including potassium phosphates, sodium carbonate, iron compounds, alkali metal hydroxides, arsenic compounds, potassium carbonate, alkaline liquids, sodium compounds (sulfide, hydroxide, carbonate, and bicarbonate), alkaline earth metal sulfides, and ammonium hydroxide. Organic compounds including alkanolamines, other amines, ethers, and esters can be used to absorb H2S. Other removal methods include oxidation, catalytic oxidation, adsorption, hydrotreating, electrolysis, regeneration of white liquor with H2S recycling in the pulp and paper industry, use of ion exchange resins, and use of synthetic zeolites as molecular sieves. The removal of H2S from liquid hydrocarbons can be accomplished by electrolysis or molecular sieves. Hydrogen sulfide can be removed from aqueous solutions by stripping with steam, degassing and plural distillation with ammonia recycle, oxidation to sulfur and ammonium thiosulfate, use of nitrogen gas, distillation, and steam reforming with preliminary hydrodesulfurization using membranes.

30906 **APTIC NO. 53336**

Stigger, Earl K.

POLLUTION CONTROL DEVICE. *(Assignee not given.) U. S. Pat. 3,693,883. 5p., Sept. 26, 1972. 4 refs. (Appl. July 20, 1970, 7 claims).*

A pollution control device related to a method of dispersing smoke from smoke stacks is presented. The apparatus comprises a vertical smoke stack having an exit opening at the top and an entrance port at the bottom and a means for introducing smoke into the entrance port and for causing it to exit from the exit opening in pulsed interrupted flow, thereby forming smoke rings. The smoke rings have a tendency to rise upward; this upward rise can replace previous construction of additional height of the smoke stack. It is a low cost method of dispersing smoke. Designs of the apparatus are given.

30907 **APTIC NO. 52849**

Sugimura, Akira and Hisanori Uchino

PURIFICATION DEVICE FOR POLLUTED GAS. *(Osenkitai no seijosochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-34024. 5p., Oct. 14, 1972. (Appl. Oct. 1, 1969, claims not given).*

A scrubber using three-stage cleaning of exhaust gases is described. A by-pass duct is connected to the stack below a partition plate. The by-pass duct connected the stack to the scrubber is a venturi tube with a water spray nozzle. Flue gases pass through the venturi section where they are cleaned by the venturi effect and the sprayed water. Then the gas enters the scrubber where warm water is sprayed from several nozzles. Water membranes form in the holes of a perforated board placed in the lower compartment of the scrubber. The exhaust gas is cleaned by the water membrane. The gas then enters the upper compartment where it is cleaned by a membrane formed from a chemical solution sprayed over another perforated board. The cleaned exhaust gas is then exhausted through the stack.

30908 **APTIC NO. 53458**

Thrun, Paul H.

VEHICLE POLLUTION CONTROL UNIT. *(Assignee not given.) U. S. Pat. 3,700,029. 5p., Oct. 24, 1972. 2 refs. (Appl. July 7, 1970, 6 claims).*

An antipollution apparatus for controlling the pollutants in engine exhaust gases is described. A housing contains a hollow tube having heat transfer plates attached which extend the length of the housing. Baffles are positioned along the length of the housing between the heat transfer plates. The housing is capped on both ends and is provided with an inlet and outlet pipe for the exhaust gases to pass through. A fluid coolant is circulated through the tube to cool the exhaust gases within the housing. Other devices heat the exhaust gases in order to oxidize them, but do not significantly reduce the pollutants. This apparatus subjects the hot exhaust gases to a significantly lower temperature, thereby oxidizing and breaking the noxious exhaust gases into the various nonnoxious compounds. (Author abstract modified)

30909 **APTIC NO. 53475**

Tourtellotte, John F., John S. Negra, Abe Warshaw, and John F. Villiers-Fisher

ENGINE EXHAUST EMISSION CONTROL SYSTEM. *(Chemical Construction Corp., New York) U. S. Pat. 3,699,683. 8p., Oct. 24, 1972. 5 refs. (Appl. April 5, 1971, 11 claims).*

A system for the prevention of hydrocarbon emissions from engines during start up is described. A cold engine generates an exhaust gas rich in unburned or thermally degraded hydrocarbons. The exhaust gas is passed through a hydrocarbon absorbent bed prior to atmospheric discharge, so that hydrocarbon vapor is absorbed in the bed. When the engine and exhaust gas are hot, and HC emission low, so most of the exhaust gas is discharged directly to atmosphere and the absorbent bed is regenerated by passing a small stream of hot exhaust gas through the bed. The resulting gaseous mixture of exhaust gas plus desorbed hydrocarbon vapor is recycled to the engine. This system prevents the emission of hydrocarbon vapors from the engine during the critical start up or warm up periods when the concentration of hydrocarbon in the generated exhaust gas is very high. Another advantage is that fuel consumption by the engine is lowered to a certain extent, since the desorbed hydrocarbon vapors are recycled to the engine intake for combustion in the engine during normal engine operation. The system and apparatus are readily fabricated and installed, do not require manual operation, and are of low cost. (Author abstract modified)

30910 **APTIC NO. 52527**

Trauffer, Walter E.

AIR POLLUTION FEATURED AT NLA CONVENTION. *Pit Quarry, 65(1): 167-169, July 1972.*

A wide variety of air pollution control methods in the lime industry are described. The use of lime in sewage treatment and for sulfur dioxide removal from gases in coal burning power plants metallurgical smelters is pointed out. A new type of rotary lime scrubber for power plants is developed, which is expected to attain high SO2 removal efficiency. Research and development work involving the application of lime products to sewage treatment, stack gas cleanup for meeting Environmental Protection Agency recommendations on SO2 and particulates, acid mine drainage, and other trade wastes is described.

30911 **APTIC NO. 53195**

Villiers-Fisher, John F.

REMOVAL OF SULFUR DIOXIDE FROM WASTE GASES. *(Chemical Construction Corp., New York) U. S. Pat. 3,650,692. 6p., March 21, 1972. 4 refs. (Appl. Dec. 9, 1969, 14 claims).*

Waste gases containing sulfur dioxide and entrained solids such as fly ash are scrubbed with an aqueous magnesium oxide sulfite slurry, which dissolves sulfur dioxide to form more magnesium sulfite and also scrubs entrained solids from the gas stream into the aqueous slurry. Magnesium oxide is regenerated by calcining a portion of the slurry or the solids component of a slurry portion, which generates a dust-laden off-gas rich in sulfur dioxide. Buildup of entrained solids such as fly ash in the system is effectively prevented by scrubbing the dust-laden off-gas with an aqueous solution, to which a portion of the solids component of the slurry or regenerated magnesium oxide may be added. The scrubbing step solubilizes magnesium compounds as magnesium bisulfite, due to high sulfur dioxide concentration, and the resulting aqueous magnesium bisulfite solution is filtered to remove residual solids such as fly ash. Magnesium oxide is added to the residual liquid phase to precipitate solid magnesium sulfite, which is filtered from the final residual liquid phase. A portion of this final liquid phase may be discarded to prevent buildup of alkali sulfates or the like, and the balance of the final liquid phase is recycled to the off-gas scrubbing step. The precipitated magnesium sulfate is recycled to the calcining step. (Author abstract)

30912 **APTIC NO. 53453**

Vogel, Calvin

METHOD FOR CONTROLLING NOXIOUS VAPORS. *(GAF Corp., New York) U. S. Pat. 3,692,567. 3p., Sept. 19, 1972. 10 refs. (Appl. June 1, 1971, 7 claims).*

A method for substantially removing noxious vapors liberated from materials treated with highly halogenated flame retarding agents upon exposure to heat is presented. The method provides for application to said materials an organophosphorus compound having the formula: (R)m PO(OR)n, wherein R is a member selected from the group consisting of alkynyl, alkenyl, and aralkenyl radicals; R is a member selected from the group consisting of alkyl, haloalkyl, and alkenyl radicals; m is a whole number from 0 to 1 inclusive; and n is a whole number from 2 to 3 inclusive, such that m plus n equals 3. (Author abstract modified)

30913 **APTIC NO. 53451**

Von Brimer, Joe W.

COMBUSTION PRODUCT PROCESSING DEVICE AND METHOD. *(Assignee not given.) U. S. Pat. 3,695,192. 11p., Oct. 3, 1972. 6 refs. (Appl. Oct. 12, 1970, 18 claims).*

A combustion product processing device and a method for treating combustion products generated in a furnace or other burner is presented. The apparatus includes a means for imparting a helical flow pattern to an influent gas stream entering a smokestack generally placed axially to the burner. The stack has inlets for additional combustion air and a means such as a gas jet to promote ignition of at least those portions of the combustion products passing nearest the sidewalls. The tangentially injected higher velocity gases impart a swirling cation to the slower, axially flowing combustion products, causing the overall helical combustion flow pattern, resulting in virtually complete combustion of the products. Because of longer dwell or residence time within the stack, higher pressures caused by centrifugal force, and higher temperatures causing combustion rate increases, greatly decreased emissions result. In one embodiment the top or outlet end of the stack is fitted with a heavy particle separator adapted to collect particulate residues, or denser gases for subsequent treatment or collection, and in other embodiments, means are filled at the outlet end of the stack to minimize axial flow and promote helical flow. (Author abstract)

30914 **APTIC NO. 52769**

Wakimura, Yoshio

A METHOD OF SMOOTHING THE OPERATION OF ENGINES BY REMOVING CARBON IN THE COMBUSTION AREA OF A CAR AND OF MINIMIZING THE CARBON MONOXIDE CONTENT OF EXHAUST GAS. *(Jidosha no nenshoshitsunai no kabon o torinozoite enjin no choshi o enkatsu narashime, haikigasuchu no issanka tanso no ryo o gokusho narashimeru hoho). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-44563. 2p., Nov. 10, 1972. (Appl. Sept. 12, 1970, 1 claim).*

Carbon deposited inside an internal combustion engine piston cylinder can be removed so that all the oxygen in the compressed air with a fuel will be consumed; thus the amount of carbon monoxide generated due to O2 shortage can be reduced. Carbon deposits are removed by a method in which a 70 cu cm solution of methyl allyl alcohol, ammonia, butyl alcohol, oleinic acid, and calcium sulfonate is poured into the damp screw hole of the plug. The hole is then closed, the engine operated for 2-3 sec without connecting the power supply, the power supply then connected, and the engine operated for 30-40 sec. This causes the carbon and dust to be removed.

30915 **APTIC NO. 52806**

Watanabe, Kazuo

DUST-COLLECTING DEVICE. *(Shujin sochi). Text in Japanese. (Nippon Kasei Co., Ltd., Iwaki (Japan)) Japan. Pat. Sho 47-34028. 3p., Oct. 14, 1972. (Appl. June 6, 1969, claims not given).*

This new coupling device was designed to make it easy to connect the mobile type dust-collection hood to the suction duct leading to a stationary dust collector. The lower portion of the suction duct is smaller and provided with a flange. The dust-collecting hood installed in a vehicle has a coupling tube that slides up or down by means of oil cylinders provided on the vehicle. The upper end of this coupling tube is also flanged. The inner lid provided in the suction duct closes and opens the lower-end opening. The lid is designed so that it may automatically open when the coupling tube is elevated, and close when the tube slides downward. A packing is fitted onto the upper-end flange of the coupling tube so that the joint between the suction duct and the coupling tube may be sealed more effectively when both are coupled to each other. Another packing is provided under the lid for the same purpose. The mechanism of this coupling device is much simpler and is operated more economically than other conventional systems. The hood and the duct are both provided with flanges which make the coupling much easier.

30916 **APTIC NO. 53308**

Weaving, John Harold and Cecil David Haynes

ATMOSPHERIC POLLUTION CONTROL ARRANGEMENT FOR INTERNAL COMBUSTION ENGINE. *(Assignee not given.) U. S. Pat. 3,702,111. 5p., Nov. 7, 1972. 7 refs. (Appl. Feb. 19, 1971, 4 claims).*

An atmospheric pollution control arrangement for internal combustion engines is described. A multi-cylinder internal combustion engine is fitted with additional valves besides the normal inlet and exhaust valves in the cylinders of the engine through which part of the gaseous products of combustion are removable, before they have passed through the exhaust system of the engine and are re-introduced into another cylinder of the engine after closure of the inlet valve. The additional valves of the cylinders are interconnected in pairs by manifolds to permit this recirculation of exhaust gases. By recirculating part of the exhaust gases from each cylinder in this way the proportion of nitrogen oxides in the final gases from the engine is reduced. By re-introducing part of the gaseous products of combustion into a cylinder of the engine after the inlet valve of the relevant cylinder has closed, the full inlet charge of air or air and fuel is maintained, whereas in known arrangements for re-introducing exhaust gases into the cylinder, at least part of the inlet charge has been replaced by the recirculated gases, thereby affecting engine performance. (Author abstract modified)

30917 **APTIC NO. 53313**

Weaving, John Harold

ATMOSPHERIC POLLUTION CONTROL ARRANGEMENT FOR INTERNAL COMBUSTION ENGINE. *(British Leyland Motor Corp., Ltd., London (England)) U. S. Pat. 3,703,164. 10p., Nov. 21, 1972. 5 refs. (Appl. Feb. 19, 1971, 10 claims).*

An atmospheric pollution control arrangement for internal combustion engines is described. The engine has an additional valve besides the normal inlet and exhaust valves in the cylinders of the engine through which part of the gaseous products of combustion are removable, before they have passed through the exhaust system of the engine. The gaseous products of combustion extracted through the additional valves are re-introduced into each cylinder of the engine after closure of the inlet valve. By recirculating part of the exhaust gases from the cylinders in this way, the proportion of oxides of nitrogen in the final exhaust gases from the engine is reduced. (Author abstract)

30918 **APTIC NO. 53337**

Wennerberg, Arnold N.

HYDRODESULFURIZATION WITH A HYDROGEN TRANSFER CATALYST AND AN ALKALINE COMPOSITION. *(Standard Oil Co., Chicago, Ill.) U. S. Pat. 3,694,350. 4p., Sept. 26, 1972. 4 refs. (Appl. March 18, 1971, 17 claims).*

A process for hydrodesulfurizing hydrocarbons with hydrogen, a hydrogen transfer catalyst, and an alkaline composition is presented. The hydrogen sulfide formed in the reaction is removed by reacting it within the reaction zone with the alkaline composition to form a solid alkaline sulfide product. The alkaline composition may be an oxide, hydroxide, sulfide, or carbonate of an alkali metal or an alkaline earth metal. Essentially complete desulfurization of heavy asphaltic hydrocarbons is achieved by this process wherein the resulting oil product consists of highly aromatic components of generally lower molecular weight. This method is particularly useful in the processing of heavy crude oils and residual stocks. (Author abstract)

30919 **APTIC NO. 53316**

Winsche, Warren E., Edward Wirsing, Jr., and Richard H. Wiswall, Jr.

RECOVERY OF SULFUR DIOXIDE. *(Atomic Energy Commission) U. S. Pat. 3,692,472. 2p., Sept. 19, 1972. 2 refs. (Appl. April 28, 1971, 3 claims).*

A unique process has been devised which is capable of removing sulfur dioxide present in relatively small amounts from a gas passed through a bed of reactive uranium dioxide at a cost which is substantially less than heretofore considered possible. Gas containing SO2 and excess oxygen is passed through a bed of reactive UO2 which absorbs the SO2 present in the process gas. Regeneration of the UO2 bed is then accomplished by passing sulfur vapor through the bed to reduce the bed material to UO2. The sulfur supplied to the bed during regeneration is recovered in the form of SO2 which may be used or sold, thereby recovering the cost of the reductant.

30920 **APTIC NO. 53182**

Yamada, Susumu

DEVICE FOR CLEANING EXHAUST GASES FROM INTERNAL COMBUSTION ENGINE. *(Assignee not given.) U. S. Pat. 3,698,875. 4p., Oct. 17, 1972. 16 refs. (Appl. May 13, 1970, 8 claims).*

A device for cleaning the exhaust gas from an internal combustion engine is described. The device comprises a housing packed with powder or chips of metals and a reservoir in the housing containing a suitable emulsion which is vaporized by the heat of the exhaust gas. The contaminants such as carbon, lead, and tar are trapped by the packed powder or chips and are adhered there by the heat of the exhaust gas. Cylindrical hollow bodies each having a filter with a catalytic action convert the harmful gases into carbon dioxide and emulsion vapors. A storage compartment contains activated carbon for removing the odor from the exhaust gas. The exhaust gas is cleaned by this device and discharged from the housing. A design of the apparatus is presented. The device is simple in construction, manufacture, and maintence, is inexpensive, and has a long life. (Author abstract modified)

30921 **APTIC NO. 52901**

Yamamoto, Kiyoichi

ABNORMALITY DETECTOR FOR ELECTROSTATIC PRECIPITATOR. *(Denkishiki kukiseijoki ni okeru ijo kenchisochi). Text in Japanese. (Matsushita Seiko Co., Ltd., Osaka (Japan)) Japan. Pat. Sho 47-38291. 2p., Nov. 20, 1972. (Appl. March 21, 1970, claims not given).*

A flaw detector was designed to detect any abnormality involving the dust-collecting electrodes section of an electrostatic precipitator. The conventional detector system in which a fuse is connected to the primary side of the transformer for detection of abnormalities is not sensitive enough to ensure complete protection of the electrodes section. This detector detects without failure any abnormality that may occur involving the dust-collecting electrodes section, thereby protecting it from any possible damage otherwise resulting from such abnormality. When the electirc current fluctuates with shorting or other malfunctioning of the dust-collecting electrodes section, the equilibrium state of the bridge circuit breaks, causing electric current to flow into the relay. This causes the on-off switch to turn to OFF at once.

30922 **APTIC NO. 52899**

Yoshino, Masataka and Atsushi Oguri

AIR CLEANER. *(Kuki seijoki). Text in Japanese. (Mitsubishi Electric Corp., Tokyo (Japan)) Japan. Pat. Sho 47-38290. 3p., Nov. 20, 1972. (Appl. Aug. 12, 1970, claims not given).*

An air cleaner is described equipped with a heat-moisture exchanger that works to adjust temperature and moisture of the outside air to the same level as the indoor air. With a conventional air cleaner without such a device, temperature and moisture levels of air remain the same of those of the outside air even after the air is cleaned. This results in higher temperature and moisture of the indoor air in the summer and lower temperature and moisture in winter. The new air cleaner solves this problem. After cleaned by the filter unit, the air flows out of the cleaner into the room through the clean air outlet port provided on the top side of the cleaner. The indoor air sucked in by another blower of the cleaner flows through the exchanger in the opposite direction and then through the discharge duct located above the outside air intake duct, and is finally discharged outdoors. The heat-moisture exchanger is made of several plain plates and corrugated sheets overlapped one upon another. Each corrugated sheet made of heat-conductive and moisture-permeable material. These corrugated sheets are arranged so that they may alternately cross each other in their set directions. This avoids mixing the exhaust air with the outside air being taken in, but achieves heat and moisture exchanges as both the exhaust air and the fresh outside air flow through it.

30923 **APTIC NO. 52918**

Yoshitsuka, Hirosuke, Yasuhiko Nagao, and Genichi Kikuchi

OFFENSIVE ODORS AND PREVENTIVE METHODS. *(Akushu to boshu taisaku). Text in Japanese. Porima no Tomo (Polymer Friends Rubber, Plast. Fiber), 9(10):641-646, Oct. 1972. 2 refs.*

Odor control methods are discussed including combustion, catalytic oxidation, ozone oxidation, biochemical oxidation, ion exchange, adsorption, scrubbing, masking, neutraliztion, and electrostatic precipitation. Scrubbing and activated carbon adsorption were tried without success on a rubber factory. When neutralization with a chemical was applied following either scrubbing or adsorption, odors were satisfactorily eliminated. This was more economical than the combustion method. Natural rubber-producing odors were analyzed by gas chromatography and mass spectrometry. The odor included hydrocarbons, aromatic hydrocarbons, and amines.

30924 **APTIC NO. 52953**

Younger, Francis C.

CHARACTERISTICS OF THE BROBECK STEAM BUS ENGINE. *Preprint, Society of Automotive Engineers, Inc., New York, 9p., 1972. (Presented at the Society of Automotive Engineers, National West Coast Meeting, San Francisco, Calif., Aug. 21-24, 1972, Paper 720684.)*

The characteristics of a low-pollution steam engine for the California Steam Bus Demonstration Project are examined. The nature of combustion in an external combustion engine is such that lower levels of exhaust emissions should be expected. To demonstrate the lower exhaust emission level and to show that steam engines are feasible powerplants for automotive applications, a reciprocating-type steam powerplant was designed, built, tested, and installed in an urban bus. The system was designed to provide performance and handling characteristics similar to those initially found in the diesel-powered bus without significantly altering the appearance of the bus or reducing its seating capacity. To accomplish this limited objective for demonstration purposes, all available space, including that under the bus, was utilized for major components. A 3 cylinder double-acting compound engine was used to extract work from steam delivered at 800 psia and 850 F. The exhaust steam was condensed in a vented system, where the exhaust is maintained at nearly atmospheric pressure. Condensate was recirculated to a monotube type vapor generator. The feedwater and burner control are similar to those used in the later Doble steam cars. Data on performance of the bus with this engine and engine designs are presented. (Author abstract)

30925 **APTIC NO. 53339**

Yuzawa, Masaharu

PURIFICATION DEVICE FOR EXHAUST GAS. *(Assignee not given.) U. S. Pat. 3,695,005. 5p., Oct. 3, 1972. 8 refs. (Appl. Nov. 4, 1970, 1 claim).*

A purification device for exhaust gases from internal combustion engines is presented. The device consists of a vertically long purification tank, a nozzle at the bottom of the tank with perforated fine pores and a connecting pipe for the passage of exhaust gas to the tank. A filter plate is installed at the center position of the purification tank and an entrainment prevention baffle plate is placed at the upper part of the filter plate, while an adsorption zone which is filled with particles of activated carbon is placed above the baffle plate. The exhaust gas discharge outlet is placed at the top of the purification tank, while another discharge outlet for draining the solution is at the bottom of the tank. The purification solution is filled to an appropriate level, but generally lower than the filter plate. The device is simplified in structure and provides for the purification of exhaust gases by dissolving of the exhaust gases by pressing-in of the gases from the finely perforated nozzle into the purification tank in a foamed form.

30926 **APTIC NO. 53180**

Zenz, Frederick A.

DUST CONTROL APPARATUS FOR FLUIDIZED BED REACTORS. *(Assignee not given.) U. S. Pat. 3,698,874. 4p., Oct. 17, 1972. 7 refs. (Appl. July 23, 1970, 9 claims).*

An improved system for reducing dust emission to the atmosphere from a fluidized bed reactor is described. The system uses cyclone separators, one of which, in addition to returning separated particles to the bed through a dip-leg, is provided with a means for bypassing a small part of the gas stream to a filtering system. The system reduces dust emission by subjecting part of the gas stream carrying nonseparable particles as an underflow stream to a filtering operation while returning separated fines to the fluid bed. (Author abstract)

1971

30927 **APTIC NO. 53200**

Carr, Norman L. and Harry C. Stauffer

OPERATION OF ADSORPTION SYSTEMS. *(Gulf Research and Development Co., Pittsburgh, Pa.) U. S. Pat. 3,630,890. 4p., Dec. 28, 1971. 3 refs. (Appl. Nov. 7, 1969, 19 claims).*

The operation of an adsorption system for the removal of at least one component from a fluid material with a porous adsorbent was improved. The flow of the fluid feed over the porous adsorbent was interrupted at the time or before the concentration in the effluent of the component material was to be removed or the concentration of component material reached a predetermined value. The flow of the fluid feed over the adsorbent was subsequently restarted. Since normal continuous adsorption methods cannot achieve maximum theoretical utilization of the adsorbent, the adsorbent bed and adsorption column must be oversized, and such a system does not realize its maximum potential. The discontinuous operation of the improved method allows the maximum potential to be reached. This method can be used to remove sulfur from gasoline. (Author abstract modified)

30928 **APTIC NO. 52532**

Clemens, David Henry and Robert Kunin

ION EXCHANGERS FOR ADSORBING SULFUR DIOXIDE FROM AIR. *(Adsorbierende Ionenaustauscherharze und Verwendung von adsorbierenden Ionenaustaucherharzen zur Entfernung von Schwefeldioxid in der Gasphase). Text in German. (Rohm and Haas Co., Philadelphia, Pa.) W. Ger. Pat. Appl. 2,164,261. 42p., Dec. 23, 1971. (29 claims).*

A process was designed for the adsorption of sulfur dioxide from gases and gaseous mixtures. Crosslinked vinyl pyridine polymers were used to adsorb the SO2. The pollutant was then eluted from the resins at 100-130 deg. A sulfonated 4-vinyl pyridine resin crosslinked with 7% divinyl benzene and 50% quaternized with methyl iodide was used to adsorb 0.624 m mole SO2/g resin.

30929 **APTIC NO. 53192**

Cohn, Johann G. E., Otto J. Adlhart, Walter Egbert, and Heinrich K. Straschil

PROCESS FOR OXIDATION OF CARBON MONOXIDE. *(Engelhard Minerals and Chemicals Corp., Newark, N. J.) U. S. Pat. 3,631,073. 3p., Dec. 28, 1971. 1 ref. (Appl. April 4, 1969, 1 claim).*

An improved process for the selective oxidation of carbon monoxide contained in feed gases from a steam reformer-converter is described. The feed gases in admixture with oxygen are contacted with a platinum group metal catalyst and the activity of the catalyst for the selective oxidation reaction is maintained by periodically treating deactivated catalyst with the selected oxidation reaction effluent gases containing less than 50 ppm carbon monoxide at a temperature of 75 C to 200 C. (Author abstract)

30930 **APTIC NO. 52535**

Frisch, Kurt Charles

ISOCYANURATE-CONTAINING PLASTICS WITH A SMOKE REDUCER. *(Isocyanurathaltige Masse). Text in German. (Owens Corning Fiberglas Corp., Toledo, Ohio) W. Ger. Pat. Appl. 2,121,821. 17p., May 3, 1971. (12 claims).*

Alkali metal fluoroborates or ammonium fluoroborate were added to isocyanurate-containing polyurethanes to minimize smoking during burning. Mixtures containing poly(oxypropylene) glycol, wetting agent, catalyst, foaming agent, and 5-20% potassium fluoroborate were foamed and cured 2 weeks

at room temperature. After a 30-second exposure to a flame, a sample containing no KBF4 produced about 25% more smoke than a sample containing 10% KBF4.

30931 APTIC NO. 52559

Henson, C. G.

JUSTIFICATION FOR A FUEL OIL ADDITIVE. *Steam Heating Eng. (London), 40(478):48-53, Sept. 1971.*

Because practical furnace operating conditions can seriously affect the efficiency of combustion, fuel-oil additives have been developed. Conditioners, which deal with the pre-combustion problems of settling out of different viscosity blends, formation of wax deposits, oxidation and polymer formation, formation of sludges, and corrosion, must be completely stable and soluble in oil during storage, unaffected by light and temperature, and rapidly dispersible. This type of additive, with a good amine will also improve combustion. During and after combustion, burner clogging, sufficiency of oxygen at the right place, smoke or particulate emission, hot corrosion, and cold end corrosion must be dealt with. The addition of manganese enables the fuel-oil to burn with less molecular oxygen and reduces cold end corrosion, acid smuts, and smoke. Reduced nitrogen compounds act as rust inhibitors, homogenize and stabilize the fuel oil, emulsify waxes, and reduce hot corrosion.

30932 APTIC NO. 53388

Keairns, D. L., J. R. Hamm, and D. H. Archer

DESIGN OF A PRESSURIZED FLUIDIZED BED BOILER POWER PLANT. *Preprint, American Inst. of Chemical Engineers, New York, 38p., 1971. 9 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 64th, San Francisco, Calif., Nov. 1971.)*

A pressurized fluidized bed boiler power plant has been designed using state-of-the-art power generation equipment. Performance costs and pollution abatement are projected for the system. A high sulfur coal-fired pressurized fluidized bed boiler power plant appears effective in meeting projected sulfur dioxide, oxides of nitrogen, and particulate emission standards and may reduce energy costs 10% below a conventional plant with sulfur dioxide scrubbing. The concept has the potential for achieving plant efficiencies of approximately 45% and energy cost reductions of approximately 15%. (Author abstract)

30933 APTIC NO. 52623

Lancaster, Brian W. and Werner Strauss

CONDENSATION EFFECTS IN SCRUBBERS. *In: Air Pollution Control, Part 1. W. Straus (ed.), New York, Wiley-Interscience, 1971, p. 377-427. 60 refs.*

It has been suggested that condensation in gas cleaning plants may substantially improve particle capture by increasing effective particle size and also by enhancing diffusion capture mechanisms. The possibility of homogeneous nucleation in a jet of hot vapor is considered in conjunction with heterogeneous nucleation. Expressions for droplet growth raty and coagulation are given. Experimental and theoretical work on collection mechanisms (impaction and coagulation; thermophoresis; Stephan flow; sweep diffusion; diffusiophoresis; and surface loss) is evaluated. In an experimental program, the efficiency of a condensation scrubber was improved by injecting steam after the particles. The dominant mechanisms influencing particle collection in the scrubber are particle buildup and subsequent impaction collection. The correlations of scrubber efficiency with steam jet parameters indicates a relation between efficiency and the mixing characteristics of the system at steam injection. Scrubber performance predicted by a condensation model showed fair agreement with experimental data. If the efficiency of steam usage can be increased by designing condensation scrubbers for adequate distribution of the condensed steam among aerosol particles, the system could be competitive with conventional scrubbers in normal applications. For removal of ultrafine particles, the condensation scrubber may be superior.

30934 APTIC NO. 52579

Lepera, Maurice E. and John G. Sonnenburg

AUTOMOTIVE FUEL CONDITIONERS: THEIR PROPERTIES AND EFFECTIVENESS. (FINAL REPORT). *Army Aberdeen Research and Development Center, Aberdeen Proving Ground, Md., Coating and Chemical Lab., Contract AMCMS 502E.11.80000, Proj. IT062105A106, Rept. CCL 3299, 35p. Dec. 1971. 7 refs.*

NTIS, DDC: AD 735338

A representative sampling of commercially available automotive fuel conditioners was obtained for laboratory study and evaluation. Physiochemical data were developed on the 19 gasoline and diesel fuel conditioners to assist in evaluating their potential effectiveness in improving overall engine performance. The data revealed that the conditioners could be grouped within three classes depending on their boiling range characteristics, a majority falling within a distillate boiling range (200-700 F). The effectiveness of the conditioners was determined using specially designed apparatus which simultated automotive induction system environments. Significant limitation was evidence by induction system deposit tests where many conditioners functioned antisynergistically. Several conditioners provided little if any reduction and/or control of deposited materials. In other instances, the presence of the conditioner resulted in an attendant increase in deposited material. These results indicate that general use of these proprietary conditioners in specification fuels is not warranted.

30935 APTIC NO. 52622

Loeffler, F.

COLLECTION OF PARTICLES BY FIBER FILTERS. *In: Air Pollution Control, Part 1. W. Strauss (ed.), New York, Wiley-Interscience, 1971, p. 337-373. 60 refs.*

Separation and adhesion mechanisms of fibrous filters are reviewed. The fibers in these filters are natural fibers (wool, cotton, cellulose) or synthetic fibers (glass, organic polymers). Comparison of theoretical adhesive forces and those measured by centrifuge and aerodynamic methods indicates that conditions in fiber filters do not favor particle adhesion by electrostatic forces. On the other hand, for separating particles from the gas stream, electrostatic attractive forces, because of their longer range than Van der Waals forces, can play a decisive role. The extent to which Van der Waals forces and capillary forces play a part in particle adhesion depends on conditions. High humidities and wetted fibers will significantly influence the capillary forces, but in many cases the adhesive force depends on Van der Waals forces. Their qualitative values, particularly in the macroscopic case, are best estimated by the Lifshitz theory. The main difficulty is determining the appropriate roughness factors. Except under very high filter loading conditions, particles ary not generally blown off fibers at the velocities common in filtration technology. Once particles are deposited, their adhesion is very firm. Higher velocities cannot be recommended without hesitation since with increasing velocities a much larger fraction of particles rebounds on impact with fibers. This is also the basis for tne experimentally observed decrease in collection observed with particles greater than 4-5 micron. The loosening of deposited particles by bombardment by new particles in the gas stream is also more probable with increasing velocity. This is shown in cine-shots. The explanation of these processes requires further investigation.

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30936 **APTIC NO. 52636**

Murray, F. E.

OXIDATION PROCESSES IN KRAFT ODOUR CONTROL. *Pulp Paper Mag. Can. (Quebec), 72(3):57-60, March 1971. 19 refs. (Presented at Canadian Pulp and Paper Association/Chemical Institute of Canada, Wood Chemistry Symposium, 3rd, Vancouver, British Columbia, June 24-26, 1970.)*

Oxidation processes are being employed to a limited degree in the control of kraft mill odors. However, the potential for use of such processes is very great. The disadvantages of using a plant furnace for thermal incineration may be avoided by using an independent waste-gas burning unit. The oxidation of sulfides and mercaptans is catalyzed by various oxidized metal surfaces, and is greatly accelerated by irradiation with ultraviolet light. Studies are now under way to provide further information on photolytic and catalytic oxidation. The two processes that determine the rate of sulfide oxidation in black liquor oxidation are the rate at which oxygen is absorbed by the liquor and the rate at which sulfide and oxygen react chemically in the black solution. Studies being conducted on the oxidation of sulfur compounds in aqueous solution should lead to improved methods of oxidizing black liquor and of deodorizing condensates in the mill. (Author conclusions modified)

30937 **APTIC NO. 52621**

Robinson, Myron

ELECTROSTATIC PRECIPITATION. *In: Air Pollution Control, Part 1. W. Strauss (ed.), New York, Wiley-Interscience, 1971, p. 227-335. 494 refs.*

The fundamentals and historical origins of electrostatic precipitation are summarized. Prior precipitation surveys are updated by describing results of subsequent studies as well as earlier work not previously included. The emphasis is on physical principles and predictive methods rather than equipment and empirical descriptions; on mechanisms of corona formations, current-voltage-field relations, particle charging, and particle collection and efficiency calculation. Special attention is given to new areas of application, especially with reference to gas composition and extremes of temperature and pressure. Comparisons of the anticipated high-temperature performance of electrostatic precipitators with thermal precipitators, fiber filters, and pebble beds indicate the relative superiority of electrostatic precipitation as a high-temperature collection mechanism. However, the limits of operation in electrostatic precipitation are still not defined with certainty and the effects of construction materials and electrode geometry may be unpredictable. Today, an estimated 4000 industrial precipitators in the U. S. treat 200,000 cu nm/sec of polluted gases. Fly ash collection in electric-power generating stations account for 60% of the total capacity. The balance is divided among steel and cement production (10% each), the processing of paper and nonferrous metals (7% each), and the chemical industry (6%). Modular units have made the electrostatic precipitator economically feasible for some smaller producers of particulate pollutants. The easily replaceable modules are particularly suitable for use with corrosive gases. Two-stage precipitators, mostly of importance in indoor air cleaning, find occasional service in aerosol sampling, food processing, asphalt saturating, radioactive particle collection, and sulfuric acid manufacture. Pilot plant and model studies are recommended before installation of full-scale units.

30938 **APTIC NO. 52531**

Sisson, Richard M.

RECOVERY OF METHYL CHLORIDE AND METHYLENE CHLORIDE. *(Verfahren zur Gewinnung von Methylchlorid und Methylenchlorid). Text in German. (Stauffer Chemical Co., New York) W. Ger. Pat. Appl. 2,143,418. 31p., Aug. 30, 1971. (15 claims).*

The design and operation of a method for the recovery of methyl chloride and methylene chloride from gaseous methane chlorination products are examined. The cooled effluent at a temperature of -60 to 10 C enters a first adsorber where the methyl and methylene chlorides and any remaining traces of chloroform or carbon tetrachloride are adsorbed on activated adsorbers, e.g., coal. Methane is then used to strip the methyl and methylene chlorides for further treatment. The recovered products are then either condensed or directly returned to the chlorination process.

30939 **APTIC NO. 53413**

Strauss, Werner

THE CONTROL OF SULFUR EMISSIONS FROM COMBUSTION PROCESSES. *In: Air Pollution Control Part 1. W. Strauss, (ed.), New York, Wiley-Interscience, 1971, p. 95-176. 110 refs.*

Processes for the removal of sulfur oxides at all stages of the combustion process are reviewed in detail with comments on their technical and economic feasibility. Sulfur can be removed from the original fossil fuel, but the sulfur is chemically bound in such a way that removal is very difficult. It is possible to gasify a fossil fuel, either coal or oil, and to release the sulfur compounds, usually as hydrogen sulfide, which can then be removed before the fuel is burned. A third possibility is to burn the fuel and then recover the sulfur oxides which have been formed. The relative concentration of sulfur dioxide in the gas is much lower in this case, but the total volume of gas to be treated is much greater. Removal of sulfur oxides at this stage can be accomplished by scrubbing of combustion gases with high concentrations of SO2; scrubbing of flue gases with low SO2 concentrations; adsorption and catalysis of SO2 on solids via catalytic conversion of SO2 in fixed beds; adsorption of SO2 in fixed, fluidized, and entrained beds; and adsorption of SO2 on material introduced into the combustion chamber. The recovery of the byproducts in most cases will not result in a profit for the operation, but in general the removal of SO2 from combustion gases will be associated with a minimum increase in the cost of power generated of the order of 0.3 mill/kWhr. Absorption and adsorption can also be used to remove hydrogen sulfide and organic sulfur compounds from flue gases.

30940 **APTIC NO. 53268**

Tatsutomi, Toyo

SYSTEM FOR PURIFYING EXHAUST GAS OF AN INTERNAL COMBUSTION ENGINE. *(Toyo Kogyo Co., Ltd., Hiroshima (Japan)) U. S. Pat. 3,704,591. 8p., Dec. 5, 1972. 5 refs. (Appl. Jan. 14, 1971, 14 claims).*

A system for purifying exhaust gases from an internal combustion engine is described. Secondary air is supplied to the exhaust gas system for reburning in response to operating conditions such as engine temperature and speed of the engine. Secondary air is also provided at low to high engine speeds during the warming operation and during low engine speeds after its warming operation. The exhaust air is purified by employing two spark plugs in one cylinder which stops or delays the igniting of only one of the two spark plugs in response to the operating conditions of the engine.

30941 **APTIC NO. 52652**

Tuggle, Michael Larry

REACTIONS OF REDUCED SULFUR COMPOUNDS WITH OZONE. *Florida Univ., Gainesville, Dept. of Environmental Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1971, 108p. 259 refs.*

The effect of ozone in the gas-phase oxidation of hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide was studied in a series of experiments with odor control in the kraft pulping industry. Concentration ratio of ozone to total reduced sulfur (TRS) and reaction temperature had a more significant effect on oxidation than did increased reaction time. An O3 concentration of more than twice the stoichiometric amount was required for complete oxidation of the sulfur conpounds at the reaction times and temperatures studied. In experiments with actual kraft emissions, O3 was effective in eliminating all of the methyl mercaptan, dimethyl sulfide, and dimethyl disulfide at an O3:TRS ratio of approximately 2.50. (Author abstract modified)

1970

30942 **APTIC NO. 52538**

Ackermann, Paul

PURIFICATION OF INDUSTRIAL WASTE GASES. *(Verfahren zur Reinigung von Gasen). Text in German. (Polycarbona Chemie-GmbH, Homberg (West Germany)) W. Ger. Pat. Appl. 2,064,527. 14p., Dec. 30, 1970. (6 claims).*

Industrial waste gases containing foam building compounds are mixed with steam before scrubbing in an empty 11 by 4 wash tower with a suitable aqueous wash liquid sprayed in 50-150 micron droplets distributed in a horizontal circular shower by a rotary atomizer disk. The dew point of the entering gases is raised 5-10 C by the admixture with steam. The cloud of droplets descends slowly with the accompanying gas steam to the base of the tower, and droplets and gases are in contact more than 5 sec before the mixture is carried by centrifugal force against circular baffle plates. The washed gases are drawn from the baffle plates through a spray of fresh water into a cyclone separator from which gases are conducted to the outside and the liquid is run into the sump. The foam-free liquid from the tower and the baffle plates collect in the sump in which the solids are separated by gravity for disposal and the supernatant liquid is recycled. (Author abstract)

30943 **APTIC NO. 52599**

Anderson, James K.

THE HISTORY OF STANDARD GRAVURE S SOLVENT RECOVERY PROGRAM. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 45-46. (Nov. 18-19.)*

The solvent recovery program at Standard Gravure Corporation is described. A short summary of a feasibility study and results from a pilot plant which lead to a choice of control equipment is presented. A system was chosen with a 98% efficiency and 95% return of the solvent entering the system. The recovery system can handle about 240,000 cu ft/min or about 4000 cu ft/min/ production press unit. The room exhaust, exhaust from two proof presses, the ink and solvent areas, the knife cleaning areas, and special air handling equipment are included in the recovery system.

30944 **APTIC NO. 52609**

Bronson, Joseph C.

A CASE HISTORY OF AIR POLLUTION AND AIR POLLUTION PROBLEMS. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 116-119. (Nov. 18-19.)*

A case history of smoke and odor emissions from the presses of a printing company and their attempt to control them is presented. The company owned 72 multi-color presses which were roll-fed sheet-delivery presses, printing two colors on one side of the web with heatset inks, and three 72-inch five by five color, 750 ft/min presses. Efforts to find a solution to the smoke odor problem included additives in the form of perfumes, precipitators, washers, filters, afterburners, catalytic units, and experimentation with glycols and steam-set inks. A chronological history of the control attempts is given.

30945 **APTIC NO. 52612**

Burachinsky, Bohdan V.

OVERVIEW OF PRINTING INK R AND D FOR CLEAN AIR PROGRAM. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 129- 137. (Nov. 18-19.)*

An overview of pollution control in the printing industry is presented. There are two basic methods, a mechanical and a chemical one, to reduce or eliminate air polluting emissions from a printing process. In the mechanical method the emission from the dryer is treated -- combusted or removed. Chemical methods include those ink system designs and modifications which defer or eliminate the need for incineration. The use of only exempt hydrocarbon solvents, formulations with non-hydrocarbon or exempt oxygenated solvents, the development of reactive inks with little or no solvent, a photoreactive system, and the use of plastisol, hot melt, and dry powder colorants are discussed briefly. Economic aspects of all of these systems are reviewed also.

30946 **APTIC NO. 52613**

Carlick, Daniel J.

SOLID STATE INKS. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 138-143. (Nov. 18-19.)*

The development and commercialization of solvent-free inks is discussed. Two segments of printing using solvents based inks are described -- heatset web offset and heatset web letterpress. The first consideration in the development of a solvent-free ink is vehicle design. The vehicle must be fluid, yet capable of converting to a tack-free state in milliseconds. Several concepts which have been developed and are being tested are described, including heat-energized catalytic systems and ultraviolet light activated systems. The operating variables, advantages and disadvantages, and economical aspects of each are reviewed.

30947 **APTIC NO. 52608**

Dahlquist, Ake

CASE HISTORY. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 111-115. (Nov. 18-19.)*

A case history of odor, noise, and smoke abatement at a printing plant in Chicago is presented. The printing company had installed two direct incineration-type afterburner units which eliminated the smoke problem. Four catalytic-type afterburners were added to the original installation to improve smoke control. Odor control was undertaken by modifying the printing process, specifically by an increased frequency of changes of catalytic charges, overhauling or replacing of burners, gas mixers, controls, and a complete overhall of all units. Other solutions considered for the elimination of odors included a change in type of ink used, and more stringent internal controls.

30948 **APTIC NO. 52601**

Duhl, Robert W.

THE USE OF ACTIVATED CARBON IN SOLVENT RECOVERY. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 55-71. (Nov. 18-19.)*

The use of activated carbon in solvent recovery in the printing industry is discussed. The best methods of control are absorption or scrubbing, incineration or adsorption. Adsorption techniques are used to remove vapors from the air, and the use of activated carbon for this purpose is extensive. Solvent recovery by means of activated carbon is used to recover almost all the commonly used industrial solvents including alcohols, chlorinated compounds, esters, ethers, hydrocarbons, and ketones. The overall recovery efficiency is between 8 and 95%, depending almost entirely upon the effectiveness of the vapor collection system. Well designed hoods over the manufacturing process will give an overall recovery efficiency of over 90%. Solvent recovery by activated carbon is described in detail. The economic feasibility of solvent recovery is reviewed, and various control equipment now used in the process and their efficiency are discussed.

30949 **APTIC NO. 52605**

Einbecker, Thomas J.

THERMAL INCINERATION. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 87-92. (Nov. 18-19.)*

Direct flame thermal incineration as a control technique is discussed. The design of a multichamber fume incinerator is described. The major segments of the incinerator -- the fume inlet chamber, fuel reaction chamber, and combustion chamber, the flow of fumes and fuel, and fuel combustion products are reviewed. The general system considerations, compliance with air pollution regulations, and the economics of heat recovery techniques are considered.

30950 **APTIC NO. 52602**

Gamble, B. L.

A CASE HISTORY. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 72-74. (Nov. 18-19.)*

The control of air quality in metal coating and decorating operations is discussed. Since most metal decorating requires elevated temperatures for curing and employ a large variety of solvents, incineration is the most widely used method of controlling air quality in these operations. This process oxidizes particulate matter and solvent gases; it is odor free, requires nominal maintenance, and permits process material changes. In order to choose the most efficient control equipment for these operations, thorough engineering and economic studies and an emission analysis are necessary. The installation of new incinerators in a facility with a total of six existing coating and lithographing lines is reviewed. A study was made to determine whether the roof should be raised, or the incinerators installed outside the building. The study established that mounting the incinerators on a steel structure above the roof was the best solution. The amount of hydrocarbon solvents exhausted from a coating line varies considerably. Sheet size and speed, film weight, and the coating composition were the production variables studied prior to the installation. Installation and operating costs of the control equipment are reviewed.

30951 **APTIC NO. 53421**

Kuzyukov, A. N. and L. V. Zaitseva

REDUCING THE CORROSION OF SOME STEELS BY SULFUR COMPOUNDS IN FLUE GAS. *Chem. Petrol. Eng. (English translation from Russian of: Khim. Neft. Mashinostr.), no. 3:226-228, March 1970.*

The effects of ammonia and 10% sodium carbonate solution on the corrosion of a variety of steels in scrubbers, flue gas pumps, and equipment for wet dust removal by flue gases resulting from the combustion of sulfur containing heavy fuel oils were investigated in laboratory experiments. The corrosion rate of St.3 steel was approximately the same in sulfuric acid vapors and in wet sulfur dioxide; stainless steels were more subject to corrosion by sulfuric acid vapors than by sulfur dioxide. The introduction of ammonia at 55 C reduced the corrosion rate of the St.3 steel and inhibited local corrosion. The corrosion rate of chromium steels was reduced, but spot corrosion was not completely inhibited. Individual spots were observed on OKh21N5T and Kh18N10T steels even in the presence of ammonia. The introduction of 10% sodium carbonate solution instead of water into the scrubbers reduced the corrosion rate of the steels; under these circumstances, sodium carbonate is used only for neutralization. The test temperature was 55 C and the test duration was 2500 hr.

30952 **APTIC NO. 53082**

Mandriko, A. S. and I. L. Peisakhov

HIGH-TEMPERATURE AND RAPID FILTRATION OF AEROSOLS, IN THE METALLURGY OF NON-FERROUS AND RARE METALS. *Soviet J. Non-Ferrous Metals (English translation from Russian of: Tsvetn. Metal.), 11(11):55-60, Nov. 1970. 3 refs.*

Tests were conducted of filters for the high-temperature and high-speed filtration of aerosols evolving in cyclone furnaces of chemico-metallurgical plants, in blast furnaces, and in electric furnaces of ore dressing plants. The test showed that several metallic fabrics had sufficient mechanical strength, a relatively high gas permeability, and sufficient rigidity, i.e., the precoat dust layer forming in their pores was not destroyed. After formation of the precoat layer on fabrics with a linear pore size of about 100 micron, filtration at 25 m/min of dust laden gases at 700-800 C reached almost 100%. Performance of the metallic fabrics was superior to that of graphite fabrics, metallocermic (cermet) filters, and quartz woven cloth.

30953 **APTIC NO. 52610**

Oertel, H. J.

SOLVENT INCINERATION AND HEAT RECLAMATION. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 120-123. (Nov. 18-19.)*

The air pollution control equipment installed at a printing company is described. The processes for which the equipment was acquired were a multi-color web offset press with a three-web dryer and a typical cooling system, and an eight-color tandem web offset press with two single-web dryers and associated cooling system. The equipment was to eliminate smoke and odor and substantially reduce the hydrocarbon emissions from the exhaust of these processes. Installation of direct-flame incinerators, operating conditions, and their efficiency is discussed. Heat recovery systems are also reviewed, and their advantages discussed. The applicability of recovered heat to other uses in the plant was considered.

30954 **APTIC NO. 53528**

Phillips, Mike

CONCORDE TO QUIT SMOKING. *Engineering (London), vol. 210:228, Sept. 4, 1970.*

While the dense smoke trails produced by Concorde prototypes are not any worse than those produced by many other aircraft, they appear so because the Concorde's engines are pure jet engines and are grouped together. Rolls-Royce engineers have solved the problem; engines for the production aircraft will produce considerably less smoke than the specification limit of 4 HSU (Hartridge smoke units) laid down by the Concorde design team. Preproduction aircraft will be fitted with engines that have low pressure fuel systems and more efficient fuel spray nozzles than the Olympus 593 engines of the prototype. These engines will exceed the specification limits only at take-off thrust. The mark 602 engines for the production Concordes will have annular combustion chambers and fuel vaporizer nozzles that will reduce smoke emission to well below the specification limits at all thrust settings. The Hartridge method has been chosen over the Ringelmann and Von Brand methods for measuring smoke. With the former, smoke is measured in HSU which are directly related to the weight of carbon produced per second. It is an optical smoke density measurement, and for comparative purposes, the variation of mean particle size found in different jet engine exhausts is not significant.

30955 **APTIC NO. 52606**

Povey, Joseph H.

CATALYTIC INCINERATION IN THE METAL DECORATING INDUSTRY. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 93- 104. (Nov. 18-19.)*

Catalytic incineration in the metal decorating industry is discussed. Catalytic reactions occur in five phases in the heterogeneous system: the organic constituents in the effluent must diffuse from the bulk of the untreated gas onto the surface of the catalyst; the organic materials must be absorbed onto the catalyst; the absorbed substances must then react on the catalyst surface; the newly formed materials must be desorbed after reaction; and the desorbed products must once diffuse into the body of the gas. Each of these phases is reviewed. System specifications and efficiency are discussed along with design criteria and heat recovery principles. Costs are cited.

30956 **APTIC NO. 52611**

Povey, Joseph H.

CATALYTIC INCINERATION IN THE PRINTING INDUSTRY. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 124-128. (Nov. 18-19.)*

Catalytic incineration in the printing industry is discussed. The application of catalysis to oxidize the organic solvents and partially oxidized hydrocarbons found in the effluent from a web offset drying oven is reviewed. The solid-catalyzed vapor phase reaction is described, and the types of catalysts and solvents used and the advantages of a catalytic oxidation system are discussed. The design of a catalytic oxidation system is presented.

30957 **APTIC NO. 52603**

Sallee, Elgin D.

THE USE OF AFTERBURNERS ON METAL DECORATING OVENS. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 75-81. (Nov. 18-19.)*

The operating procedure and a variety of methods to control solvent emissions in a metal decorating facility are discussed. The operating efficiencies of burners, water scrubbers, catalytic combustion units, and direct-fired afterburners to reduce hydrocarbon and carbon monoxide emissions are described. Control problems involved, including odor, reduction of temperature, and heat exchange are reviewed.

30958 **APTIC NO. 52598**

Scott, Richard H.

CASE HISTORY. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 41-44. (Nov. 18-19.)*

The recovery of gravure printing solvents at a paper printing facility is described. The installation operates on an annular static carbon bed adsorption process. Solvent vapors are adsorbed on activated carbon beds which are steam stripped, condensed into holding tanks, separated water drawn off and solvent returned to storage. The installation has a rated efficiency of 72% in summer, and over 80% in mid-winter. The further expanding of recovery facilities and equipment is also discussed. Two alternative approaches to equipment choice are reviewed. The installation of a static carbon bed design, similar in principle to the existing installation, and of two 13-unit press lines, and the advantages of each are discussed. Design considerations of each are reviewed.

30959 **APTIC NO. 52604**

Seagren, G. W.

REFORMULATION OF SOLVENTS IN METAL DECORATING. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 82-86. (Nov. 18-19.)*

The reformulation of solvents in metal decorating in order to comply with Los Angeles County Regulation 66 and the San Francisco Bay Area Regulation 3 is discussed. Rule 66 affects the user of organic coatings in that it requires that no more than 40 lb/day of photochemically reactive solvent may be discharged into the atmosphere from any unit that is not a baking oven (spray booths, roller coasters). For emissions from baking ovens, photochemically reactive solvents are limited to 15 lb/day/unit. Regulation 3 requires that no more than 10 lb/day of reactive solvents may be evaporated from any unit. These regulations were directed toward decreasing eye irritation due to air pollution. Various solvent systems which can comply with the rules are discussed, including solvent systems for vinyl resins, epoxy resins, alkyd resins, and aliphatic hydrocarbon solvents.

30960 **APTIC NO. 52556**

Sigal, Issak Jakowlewitsch, Georgij Fedorowitsch Najdenow, Nikolaj Alexandrowitsch Gurewitsch, Julij Iosifowitsch Danilewitsch, Andrej, Matwejewitsch Schiman, Viktor Fedorowitsch Schischkin, and Nikolaj Iwanowitsch Gontscharenko

THERMAL PURIFICATION OF WASTE GASES COMPRISING MOSTLY ORGANIC CONTAMINANTS. *(Verfahren zur thermischen Reinigung von Abgasen von im wesenlichen organischen Beimengungen). Text in German. (Academy of Sciences, Kiev (Ukrainian SSR), Inst. of Gas) W. Ger. Pat. Appl. 2,027,535. 11p., June 4, 1970. 4 refs. (3 claims).*

A method for the removal of organic contaminants from the exhaust gases of chemical processes by thermal purification was examined. The method involves the removal of such organic contaminants as aldehydes and ketones through combustion to carbon dioxide, water, and other less toxic products by feeding the waste gases into the combustion zone of a steam boiler. The waste gas flow is divided into small flows which are uniformly distributed over the supplied combustion air flow. The method could also be applied to the removal of paraffins from the exhaust gases of synthesis processes.

1969

30961 **APTIC NO. 53021**

Sarna, M.

THE PROBLEM OF CLEANNESS OF THE SIGMA COLLECTING ELECTRODES OF AN ELECTROFILTER. *(Czystoso elektrod zbiorczych typu SIGMA w. elektrofiltrze). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 3(3):1-8, 1969. 3 refs.*

NTIS: TT 70-55123/3

The forces binding the dust collected on the collecting electrodes of an electrofilter are generally discussed with an emphasis on the significance of adequate cleaning of the electrodes. Some of the results of the studies aimed at finding optimum values of the accelerations in the impact excitation for the SIGMA electrodes are reported. The relation between the acceleration values and the character of the time run of the vibrations, which are the response of the electrode system to a short-time impulse, allows the evaluation of a given system in terms of its usefulness in the electrofilter. Data also permit the comparison of various systems. The quantitative picture of the character of vibrations and of the characteristics of the system obtained provided a basis in choosing an appropriate mathematical approach in further analytical and experimental work on the optimum [illegible]

1961

30962 **APTIC NO. 53140**

VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany), Kommission Reinhaltung der Luft

RESTRICTING EMISSION OF DUST FROM MANUALLY OPERATED CENTRAL-HEATING BOILERS, CAPACITY 600,000 KCAL/HR AND LESS, FIRED WITH SOLID FUELS.

(Staubauswurfbegrenzung Handbediente Zentralheizungskessel fur feste Brennstoffe mit Leistungen bis etwa 600 000 kcal/h). VDI (Ver. Deut. Ingr.) Richtlinien, no. 2115, June 1961. 10 refs. Translated from German. Joint Publications Research Service, Washington, D. C., APTD-1481, 14p.

NTIS: PB TT-65-40655

Particular attention must be given to proper air-flow design of combustion chamber and boiler flues and selection of suitable fuel in order to restrict emission of dust from manually operated, central-heating boilers of 600,000 kcal/hr and less capacity, fired with solid fuels. Some fuels for customary boilers which comply with the boiler manufacturer are: Crushed coke No. 1, 80-60 mm; crushed coke No. 2, 60-40 mm; crushed coke No. 3, 40-20 mm; anthracite nut No. 1, 80-50 mm; and Anthracite nut No. 2, 50-30 mm. Average values of actually constructed installations at nominal rating for boilers of customary design fired with coke and anthractie are: 150-300 C temperature; carbon dioxide content (of dry flue gas), 12-16%; and dry flue gas volume of 11.3 cu Nm/kg of fuel at 14% CO2. Some factors influencing the increase of dust formation are: high content of breeze, grain size too small, high content of volatile components, combustion of waste in large amounts, excessive stoking, unsuitable grants construction, excessive air velocity in fuel bed, high grate-surface loading, poor air distribution, nonuniform fuel layer, unclean grate, excessive velocity of combustion gases due to restrictions, and excessive utilization of paper, excelsior, or wood for fire making. When burning coke or anthracite, dust emission is so minor that it is not necessary to establish any degree of restriction. When burning other types of coal as well as peat and wood, unfavorable conditions of combustion may lead to a visible discoloration of the flue gases through emission of dust and soot. The maximum permissible blackness of flue gases when burning coal with high gas content, peat, and wood should be kept below No. 2 of the Ringelmann scale. Gravimetric methods of measurement permitting reliable, exact, and simple determination of discharge volumes from central-heating boilers do not yet exist. Control methods are described.

30963 **APTIC NO. 53428**

VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany), Kommission Reinhaltung der Luft

THE RESTRICTION OF CHLORINE GAS EMISSION.

(Gasauswurfbegrenzung Chlor). VDI (Ver. Deut. Ingr.) Richtlinien, No. 2103, Jan. 1961. 8 refs. Translated from German. Joint Publications Research Service, Washington, D. C., APTD-1474, 14p.

NTIS: PB 221254-T

Waste chlorine may originate both from gaseous and liquid chlorine or may escape from saturated solutions; since it is generally obtained in highly concentrated form during production and is utilized in this form, the volume of waste gases is not increased by ballast gases. Chlorine can be extracted with water in wash towers or other customary scrubbers (also under pressure) if the chlorine-containing waste gases occur at a uniform rate. The use of sodium hydroxide as an absorptive solution, though more expensive, permits rapid and complete absorption of chlorine from waste gases and can be utilized for the production of bleaching lye. The absorption of chlorine in slaked lime is practically complete and is satisfactory technically and economically. A transformation of the active chlorine by filtering with active carbon is not possible in this process, however. It is also possible to extract chlorine from waste gases by the use of non-aqueous liquids which have an affinity for chlorine, e.g., carbon tetrachloride or hexachlorobutadiene which are recirculated. In the vicinity of installations producing and processing chlorine, the maximum concentration of chlorine in the atmosphere should not exceed 0.3 mg Cl/cu m as a half-hour mean value for continuous exposure. All waste chlorine occurring within an installation should be conducted through equipment in which it is either absorbed or made ineffective when necessary. The chlorine residue in purified waste gas should not exceed an amount of 3 mg/cu m.

30964 **APTIC NO. 52986**

Willet, Howard P. and Daniel E. Pike

THE VENTURI SCRUBBER FOR CLEANING OXYGEN STEEL PROCESS GASES.

Iron Steel Engr., no. 38:126-131, July 1961. 7 refs.

The choice of a gas cleaning system for an oxygen steel plant is usually reduced to either a venturi scrubber or an electrostatic precipitator. Venturi scrubbing systems are less expensive, produce less secondary air pollution from waste dust transportation, require less attention, require less space, and discharge less dust per hour. Steel plant process gases contain minute dust particles and carbon monoxide. The carbon monoxide is essentially oxidized to carbon dioxide in the hood, although with a venturi system it is not essential that all of the CO be oxidized. Waste gas in the hood contains carbon dioxide, molecular nitrogen, and sometimes carbon monoxide or excess air. One type of venturi system incorporates the following power-saving features: induced air is limited to that required for combustion; water vapor is condensed from the cleaned gas to reduce gas volume at the fan, thus reducing fan power, virtually eliminating the steam plume, and saving water; and gas and water flows are throttled between heats. The collected dust leaves the scrubber in a slurry which can be thickened to form a cake which can readily be converted into a suitable furnace burden.

196E

30965 **APTIC NO. 53138**

VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany), Kommission Reinhaltung der Luft

RESTRICTING EMISSION OF SULPHUR DIOXIDE FROM COKE OVENS AND GAS PLANTS.

(Gasauswurfbegrenzung Schwefeldioxyd Kokereien und Gaswerke Koksofen (Abgase)). VDI (Ver. Deut. Ingr.) Richtlinien, no. 2210, Aug. 1960. 21 refs. Translated from German. Joint Publications Research Service, Washington, D. C., APTD-1480.

NTIS: PB 221242-T

The conversion of sulfurous admixtures to sulfur dioxide during the combustion of underfeed gas in coke and gas plants leads to the discharge of SO2 together with waste gases of the coke oven battery into the atmosphere. The emission of SO2 depends on the volume of underfeed gas and its content of sulfur compounds. The sulfur content of coking coal is dependent on the type and processing of the coal extracted in the individual mines. A maximum of 30% of the total sulfur remains coke oven gas during coking, and the emission of SO2 with the waste gases is dependent on the content of the underfeed gases in sulfurous admixtures and on the volume of the gas conditioned by its calorific value. Such emission can be reduced by partial desulfuration of coke oven gas (scrubbing and extraction of hydrogen sulfide with up to 80% removal) or by the firing of coke ovens with sulfur-free underfeed gases such as blast-furnace gas, methane from mines, and recirculated coke oven gas. Low-layer SO2 concentration can be reduced by stack design since at a given emission this concentration (disregarding meteorological conditions) is determined by stack height as well as the temperature and velocity of the waste gases at the top of the stack.

30966 **APTIC NO. 53430**

VDI (Verein Deutscher Ingenicure), Duesseldorf (West Germany), Kommission Reinhaltung der Luft

RESTRICTING EMISSION OF HYDROGEN SULPHIDE AND OTHER SULPHUR- CONTAINING COMPOUNDS, EXCEPT SULPHUR DIOXIDE, FROM GAS GENERATORS IN COKE, GAS, AND COAL-CONSTITUENT PROCESSING PLANTS. *(Gasauswurfbegrenzung Schwefelwasserstoff und andere schwefelhaltige Verbindungen auBer Schwefeldioxyd Kokereien und Gaswerke, Kohlenwertstoffbetriebe). VDI (Ver. Deut. Ingr.) Richtlinien, No. 2109, May 1960. Translated from German. Joint Publications Research Service, Washington, D. C., APTD-1479, 22p.*

NTIS: PB 221191-T

The emission of hydrogen sulfide and other sulfur-containing compounds at various points of coal constituent processing plants varies greatly and is dependent of the type of operation. The following measures can serve to reduce such emissions: careful maintenance and care of stop valves, ignition of escaping gases at the proper time, regular inspection of the seal level, proper closure and appropriate ventilation of outflow collectors and tanks, partial desulfurization of the coke oven gas, indirect cooling of outflow, proper closure and appropriate ventilation utflow receivers and tanks, and adequate cooling of distillates and return of ventilating gases into the gas system of the coke plant. The content of non-purified, partially desulfurized, and purified coke oven gas (municipal or pipeline gas) in H2S and organic sulfur compounds is as follows: 5-13 g/cu Nm of H2S and 0.5-1.3 g/cu Nm organic sulfur for non-purified; 1.5-5 and 0.2-0.6 g/cu Nm, respectively H2S and organic sulfur for partially desulfurized; and 0.08-0.25 g/cu Nm of organic sulfur (no H2S) for municipal or pipeline gas.

1958

30967 **APTIC NO. 53539**

Mrozowska, W.

DETERMINING THE DUST RETENTION EFFICIENCY OF DUST COLLECTING INSTALLATIONS. *(Pomiary spawnosci urzadzen odpylajacych). Polish Academy of Sciences, Bull. 14, p. 53-89, 103, 136-137, 1958. Translated from Polish by H. Warfield. National Institutes of Health, Bethesda, Md., Oct. 29, 1959, 89p.*

The general efficiency of dust filters is determined by gravimetric, photometric, or quantitative methods. The gravimetric method takes into account only large dust particles and is primarily for testing industrial filter installations. The efficiency of laboratory filters and industrial precision filters (e.g., electrostatic filters) is measured by the photometric method which can also serve to determine low concentrations of fine dust, and particularly the degree of air pollution. The quantitative method, which is based on microscope counts of dust particles in gas, is widely used in air pollution control for determining the degree of atmospheric pollution. Since overall filter efficiency varies with the granulometric composition of dust, fractional efficiency data are the basis on which filters are evaluated and compared. The fractional efficiency is most conveniently determined by a graphic method. Sampling probes, metering filters, and other equipment required by the above methods are discussed together with blower and sedimentation techniques for fractional dust analysis. The sedimentation technique makes it possible to analyze in one operation any dust regardless of its specific gravity including 5-100 micron fractions. In Poland, dust retention efficiencies of 97-99% have been reported for a cyclone type separator used by fertilizer plants and nitrogen works. Potential applications of the cyclone include separating ore dusts from blast furnace gases and coal fines at coal-grading plants.

MEASUREMENT METHODS

1973

30968 **APTIC NO. 52743**

PRECISION MECHANICS AND OPTICS -- ENVIRONMENTAL PROTECTION AS TASK. *(Feinmechanik und Optik. Umweltschutz als Aufgabe). Text in German. Wasser Luft Betrieb, 17(8):252-253, 1973.*

A survey of optical instruments and methods which serve environmental pollution problems is given. A number of gases ozone, carbon monoxide, nitrogen dioxide, and sulfur dioxide can be measured by direct photometry in the ultraviolet, visible, and infrared spectral ranges. The two-beam arrangement is customary with the second beam serving for comparison. Lasers are increasingly coming into use for pollutant measurements. They permit the sensing of pollutants over longer paths. Also, infrared Fourier spectroscopy is receiving increasing interest. Air polluting gases which have no specific self-absorption can be absorbed in solvents, enriched, and, after characteristic color reaction with a reagent, analyzed by colorimetry or spectrophotometry. All inorganic as well as a number of organic gases can be analyzed by colorimetry with high accuracy. Dust concentrations can now be measured with electrostatic scales or oscillator crystals to a million of a gram. Particle number and size are mostly determined under the microscope. The scanning microscope-photometer and the quantitative television microscope are available for these tasks.

30969 **APTIC NO. 53214**

A FRACTOMATIC PROCESS CHROMATOGRAPH. DETERMINATION OF HYDROCARBONS IN LIQUID AIR AND IN OXYGEN. *(Cromatografo da processo fractomatic. Determinazione di idrocarburi in aria e ossigeno liquidi). Text in Italian. Ing. Chim. (Milan), 22(1):7-11, Feb. 1973.*

A major danger in the liquefaction of air is the presence of hydrocarbons in the processed air; the danger of explosion in the case of acetylene for example, occurs with concentrations between 0.06 and 0.6 ppm. A fractomatic process gas chromatographic method is described designed to determine the presence of hydrocarbons in aspirated air by means of two columns. One column, the stripper, separates heavy hydrocarbons which would interfere with subsequent determination; the second analytical column completely separates hydrocarbons to be determined. By appropriate setting of the first column it is possible to limit separation to C1-C2 (analytical time 5 minutes), to C1-C2-C3 (analytical time 10 minutes), or to C1-C2-C3-C4 (20 minutes). The procedure is completely automated and a potentiometric recorder draws a bar-graph chromatogram in continuous registration. The minimum detectable quantity for methane is 6 ppm, for acetylene, ethylene up to 1,3-butadiene between 0.02 and 0.08 ppm. Quantitative sensitivity depends on calibration. Sequential introduction of a standard sample will provide for the control of the proper functioning of the chromatograph. The system is now in use in 114 establishments as a safety precaution.

30970 **APTIC NO. 53185**

Agranov, Kh. I., V. V. Aleksandrov, and L. A. Bqlozerova

A STUDY OF THE OPTIMUM OPERATING CONDITIONS OF AN ELECTROCHEMICAL NITROC OXIDE (NO) DOSIMETER. *(Issledvaniye optimal nykh usloviy raboty elektrokhimischeskogo dozatora okisi azota (NO)). Text in Russian. Zh. Prikl. Khim., 46(6):1238-1242, 1973. 9 refs.*

The optimum operating conditions of the platinum-nitrosylsulfuric acid plus sulfuric acid-platinum system as an absolute coulometric nitric oxide generator were studied. A system composed of 4n-NOHSO4 + 90% H2SO4 was best for the

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quantitative generation on NO, proportional to the polarization current according to Faraday s law, within a current density range of 1.35 to 6.75 mA/sq cm, the cell temperature being 18 + or 2 C. The maximum duration of continuous operation is 5 hr. The coulometric NO dosimeter is recommended for use in analytical procedures with preliminary check-up analysis required.

30971 **APTIC NO. 53048**

Atlasov, A. G. and A. G. Novikova

DETERMINATION OF CHLORINE DIOXIDE IN AIR SAMPLES. *(Opredeleniye dvuokisi khlora v vozdukhe). Text in Russian. Gigiena i Sanit., no. 6:76-77, 1973.*

A colorimetric method for the determination of chlorine dioxide in industrial air is described. Five to ten liters of air are sampled at a rate of 0.5 l/min through 2% solution of potassium iodide. Chlorine, possibly present in the air is preliminarily removed by means of malonic acid as an absorbent. The solution is then transferred into a colorimetric tube, and combined by aqueous solution of dimethyl-p-phenylenediamine. The elementary iodine from the reaction of potassium iodide with ClO2 forms a pink compound with dimethyl-p-phenylenediamine. The coloration of the solution, developing in 15 min, is compared with a standard series. Also photometric determination in a cuvette with a layer thickness of 10 mm is possible at a wavelength of 536-640 nanom.

30972 **APTIC NO. 52845**

Black, Marilyn and Robert E. Sievers

ENVIRONMENTAL ANALYSIS PROBLEMS CREATED BY UNEXPECTED VOLATILE BERYLLIUM COMPOUNDS IN VARIOUS SAMPLES. *Anal. Chem., 45(9):1773- 1775, Aug. 1973. 7 refs.*

A study of the problems involved in gas chromatographic analysis of beryllium indicated the existence of naturally occurring volatile beryllium compounds in orchard leaves. The various digestion and ashing procedures of the leaves demonstrated that Be is lost in the vapor phase at relatively low temperatures (less than 200 C). This suggests that a considerable amount (at least 90%) of Be in orchard leaves may be organically bound and that it is lost upon destruction of the organic matrix unless precautions are taken. Beryllium was also found in all impinger samples of air particulates from a Be machining facility. The concentration was highest in the cold traps indicating that volatile Be compounds are present in the vapor state in shops where Be is machined. Quantitative measurements for Be made by a gas chromatographic-mass spectrographic system agreed well with those of an electron capture gas chromatographic method.

30973 **APTIC NO. 53072**

Boettner, E. A. and B. J. Thompson

MULTIPLE EXPOSURE HOLOGRAPHY OF MOVING FIBROUS PARTICULATE MATTER IN THE RESPIRATORY RANGE. *Opt. Eng., 12(2):56-59, March/April, 1973. 10 refs.*

The application of Frauhofer (far-field) holography to the study of particulates in environmental situations is discussed. The technique was used in studies with single and multiple exposure holograms of particles of ground talc containing both tremolite and asbestos. These holograms showed the size, velocity, and behavior of the particles as they fell through the air, indicating the validity of the method. The technique can be used in the future to measure particle orientation during fall or movement, to study the interactions between particles under various conditions, to investigate the settling characteristics of individual particles within a cloud as a function of the number of particles per unit volume in that cloud, to determine the effect of particles of anisokinetic sampling, including the fate of particles at sample probe inlets, and to evaluate the effects of a vertical wall on moving particles as a function of distance from the wall. These problem areas are of particular interest in the study of coal and foundry dusts and the study of asbestos and other fibrous materials. (Author abstract modified)

30974 **APTIC NO. 53013**

Bortner, M. H., F. N. Alyea, R. N. Grenda, G. M. Levy, and G. R. Liebling

ANALYSIS OF THE FEASIBILITY OF AN EXPERIMENT TO MEASURE CARBON MONOXIDE IN THE ATMOSPHERE. *General Electric Co., Philadelphia, Pa., National Aeronautics and Space Administration Langley Research Center Contract NAS1-10139, 265p., 1973. 35 refs.*

A theoretical analysis was carried out to determine the feasibility of measuring atmospheric carbon monoxide from a remote platform using correlation interferometry. The Carbon Monoxide Pollution Experiment was feasible for obtaining a global CO map and a vertical CO profile. The CO data can be obtained with an accuracy of 10% using this technique on the first overtone band of CO at 2.3 micron. That band is much more suitable than the stronger fundamental band at 4.6 micron. Calculations for both wavelengths are presented to illustrate the effects of atmospheric temperature profiles, inversions, ground temperature and emissivity, CO profile, reflectivity, and atmospheric pressure. The radiative transfer theory on which these calculations are based is described. The computer program for computing theoretical absorption-emission spectra of the earth s atmosphere as would be observed by a correlation interferometer and for computing the Fourier transform of the spectrum is described. (Author abstract modified)

30975 **APTIC NO. 53563**

Buszkowski, Marek, Stanislaw Chorazy, and Agnieszka Cybulska

A MODIFIED AIR SAMPLING METHOD FOR THE DETERMINATION OF NITROGEN OXIDES IN WELDING SHOPS. *(Modyfikacja metody pobierania prob powietrza na zawartosc tlenkow azotu no stanowiskach spawalniczych). Text in Polish. Ochrona Pracy (Warsaw), 27(4):8, 1973.*

The new modified air sampling method for the determination of nitrogen oxides during welding processes consists of absorbing the air from under the shield--by the welder s face--by means of a rubber aspirator of known volume. The apparatus is composed of the following elements: a rubber aspirator; glass tanks with a 250 ml capacity provided with rubber corks and metallic nuts; screw tighteners and an injector needle. The proposed method is simpler and more convenient compared to other methods, and the error margin is very low, since it does not exceed 5 to 8%. Another advantage of the method is sampled air transfer from the rubber container to the tank with the absorbing liquid. It facilitates a complete reaction of the nitrogen oxides with the absorbing solution. The method can be applied in any situation and secures safe working conditions.

30976 **APTIC NO. 53237**

Charpenet, L. and R. Ponsonnet

ANALYTICAL METHODS FOR THE DETERMINATION OF NITROGEN OXIDES OCCURRING IN DIESEL OR CONTROLLED IGNITION ENGINE EXHAUSTS. *(Methodes d analyse des oxydes d azote contenus dans les gaz d echappement des moteurs diesel et des moteurs a gaz a allumage commande). Text in French. Analusis, 2(5):383-391, May 1973. 17 refs.*

Analytical methods for the determination of nitrogen oxides in exhaust gases from diesel and spark ignition engines including the colorimetric Saltzman method, polarography, mass spectrometry, the non-dispersive ultraviolet method, the non-dispersive infrared method, gas chromatography, and chemiluminescence were described, and the last three were evaluated by tests on exhaust gases from respective engines. The Saltzman method takes too long, an analysis lasts from 30 to 45 minutes, the lower detection limit is 2 ppb. Polarography, an electrochemical method, is a sensitive and fast method, but carbon interferes because of the proximity of CO and nitric oxide redox potentials. Ultraviolet analysis should be used with another method because of potential interference by sulfur and organic compounds. Mass spectrometry is a good method permitting the determination both of NO and nitrogen dioxide. Gas chromatography is difficult and cumbersome. The infrared method has a detection limit of 50 ppm, but the determination takes only 30 seconds and is very exact. Chemiluminescence has good sensitivity of 1 ppm and the interference of various gases is weak, 5% CO causes a deviation of 30 ppm; 12% carbon dioxide, 0.25% CO, and 8% oxygen together cause a deviation of only several ppm. Results obtained with the infrared method are higher than those obtained with the chemiluminescence method.

30977 **APTIC NO. 53043**

Clarke, R. P.

TECHNIQUES FOR SAMPLING AND IDENTIFYING AIRBORNE PARTICLES. *J. Physiol. (London), 232(1):5-7, July 1973. 3 refs.*

Cascade impactors can be used to sample airborne particulates, including skin scales lost by the rubbing actions of clothes and limbs. Since large numbers of skin scales are shed daily by each person (7 million/min) and since many carry microorganisms, their airborne concentration was determined, and the proposal that skin scales form a normal constituent of airborne particulates was studied. A Royco Portable Particle Monitor was used to sample air and determine size distribution. Much dust appears to be organic in origin and is probably due to skin scales.

30978 **APTIC NO. 52846**

Creed, E. R., D. R. Lees, and J. G. Duckett

BIOLOGICAL METHOD OF ESTIMATING SMOKE AND SULPHUR DIOXIDE POLLUTION. *Nature (London), 244(5414):278-280, Aug. 3, 1973. 8 refs.*

Smoke and sulfur dioxide pollution at 104 sites in southern Britain was estimated by measuring the number of bryophyte species on the boles of oak trees; the maximum height at which they were found; the proportion of bark at 1.5 m covered with algae of the genus Pleurococcus, crustose, and foliose lichens; and mean trunk reflectance at the same height. With the exception of Pleurococcus cover, all the parameters measured had high linear correlation coefficients with SO2 and smoke. Multiple regression calculations indicated the occurrence of high SO2 levels in London, Birmingham, Lancashire, Yorkshire, East Anglia, and the valleys of South Wales. Smoke levels were high in the Lancashire/Yorkshire region and decreased progressively in the Birmingham area and London. In contrast to the high SO2 values obtained for East Anglia, smoke levels were generally low in all rural areas.

30979 **APTIC NO. 53112**

Dharmarajan, Venkatram

DEVELOPMENT OF ANALYTICAL METHODS FOR THE DETERMINATION OF INORGANIC AIRBORNE PARTICULATES. *Louisiana State Univ. and Agricultural and Mechanical Coll., Baton Rouge, Dept. of Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1973, 123p. 126 refs.*

A ring oven technique was developed for the simultaneous determination of beryllium, cadmium, chromium, cobalt, copper, lead, nickel, and zinc on one ring. Particulates are collected with high-volume or tape samplers and the metal cations are washed by suitable solvents. The ring is then dried and cut into as many sectors as the number of metals to be determined. The necessary reagent is then applied to each sector so that only the materials under consideration react to give a colored product. Where a specific reagent is not available for a metal, masking agents are applied. Beryllium gives a sensitive yellow-green fluorescent product with morin (3,5,7,2,4-pentahydroxyflavone). Cadmium and ferrousdipyridyl iodine form a bright pink ion association complex. Copper reacts with dithioxamide to produce green or black stain. Chromium and diphenylcarbazide form a violet, water-soluble complex. Lead reacts with dithizone (diphenylthiocarbazone) to produce a red stain, while zinc reacts with dithizone to produce a reddish-violet complex. Nickel reacts with dimethylglyoxime to produce a brilliant red precipitate. Cobalt and 1-nitroso-2-naphthol produce an insoluble brown product. Mexican air samples analyzed by the ring oven method contained only copper and lead; Lake Charles, Louisiana, samples contained zinc and lead. Air samples were also analyzed for metals by an atomic absorption spectrophotometric technique involving mixed ligand extraction and aspiration of metal chelates into air-actylene flame. Agreement between this method and the ring oven method was good.

30980 **APTIC NO. 53562**

Fontijn, Arthur and Pieter H. Vree

METHOD OF DETERMINING TRACE AMOUNTS OF GASES. *(Aerochem Research Labs. Inc.) U. S. Pat. 3,713,773. 4p., Jan. 30, 1973. 2 refs. (Appl. Nov. 9, 1970, 19 claims).*

A method of detecting trace amounts of volatile substances such as carbon oxides, nitrogen oxides, sulfur oxides, ozone, and oxygen has been developed based on the production of ions in reactions of activated species. The procedure consists of taking a measured sample of the gaseous mixture containing the gas to be detected, separating the gas being detected from the mixture where necessary, forming a first component which includes the gas being detected and, preferably, a carrier gas, providing a second component which contains a substance to be reacted with the first component to produce chemi-ions, activating at least one of the substances to produce the species necessary to form chemi-ions, mixing the components to form the chemi-ions, passing the mixture between electrodes, and measuring an electrical current produced by the chemi-ions formed. The method can conveniently be used to analyze the output of gas chromatography and can equally as well be used in continuous analyzing of a substance to be detected. (Author abstract modified)

30981 **APTIC NO. 53053**

Forrest, J. and L. Newman

SAMPLING AND ANALYSIS OF ATMOSPHERIC SULFUR COMPOUNDS FOR ISOTOPE RATIO STUDIES. *Atmos. Environ., 7(5):561-573, May 1973. 20 refs.*

The Isotope Ratio Tracer method was developed for sampling atmospheric sulfur oxides and for processing the samples for the determination of stable sulfur isotope ratios. Milligram quantities of oxides were collected with high volume sampler packs consisting of glass fiber filters to retain particulate sulfate and alkaline impregnated papers which absorbed sulfur dioxide. Pretreatment reduced filter blanks to reasonable levels. The effect of concentration, temperature, and humidity upon sampling efficiency is described. Various types and grades of particulate filters showed a wide range of adsorption of sulfur dioxide with formation of extrinsic sulfate. Modified procedures developed for treating small samples produced pure sulfur dioxide for mass spectrometry. Sulfur concentrations were measured during sample preparation by a 110 Ag tracer technique. (Author abstract)

30982 **APTIC NO. 52843**

Frechette, Michael W., James L. Fasching, and Douglas M. Rosie

EVALUATION OF SUBSTRATES FOR USE ON A PIEZOELECTRIC DETECTOR. *Anal. Chem., 45(9):1765-1766, Aug. 1973. 7 refs.*

Of the compounds screened for use as substrates for a piezoelectric detector for sulfur dioxide, the most satisfactory were SDM polymer, phenyldiethanolamine, and PP-2040. Although tridodecyl amine and tripopyl amine were the most sensitive toward SO2, both materials bled from the quartz crystal in the detector and also showed partial retention of SO2. The only common interference was nitrogen dioxide. The detection limit of SO2 with the experimental cell was 2-5 ppm. More work is being done to lower the limit and perfect the system.

30983 **APTIC NO. 52731**

Gnyp, A. W., S. J. W. Price, C. C. St. Pierre, and J. Steiner

PARAMETERS AFFECTING THE DESIGN OF A SAMPLING PROGRAM. PART 5. *Water Pollution Control (Toronto), 111(7):40-42, July 1973. 8 refs.*

Significant considerations in stack sampling include sampling site location, number of sampling points, sampling time per point, total sampling time, and sampling method. Sampling should be done where there are symmetrical and similar flow patterns for solids and gases and where flow direction is parallel to the axis of the flue. Generally, differences in flow and solids distribution are enhanced for larger particles, high gas velocities, and small radii of curvature upstream. Test codes recommend sampling in vertical ducts rather than in horizontal sections because more uniform and symmetrical velocity and particulate distributions are to be expected in vertical flow. Systematic errors are smaller for a given number of sampling points if a site is as far downstream of flow disturbance as practically possible. For sampling at stack or flue exit, an extension of least two diameters should be installed above the point of probe insertion to minimize downwash of winds and breezes.

30984 **APTIC NO. 53492**

Gnyp, A. W., S. J. W. Price, C. C. St. Pierre, and J. Steiner

STACK SAMPLING...FACTORS AFFECTING ACCURACY. *Water Pollution Control (Toronto), 111(8):40-42, Aug. 1973.*

The accuracy of stack sampling is affected by the number of sampling points, sampling time/point, and total sampling time. The magnitude of bias due to sampling at a limited number of points is summarized for flow patterns found at solid fuel power plants with rectangular flues. Results for circular flues are believed to be similar. Recommendations for determining the number of sampling points are tabulated. At least 10 minutes is required for the collection of a detectable amount of particulate material from relatively clean air streams. For very high dust loads, sampling times much in excess of 2 minutes can lead to serious overloading of pollutant collectors, especially if the cumulative sampling technique is used. The overall test should be as long as possible (i.e., 2-6 hours) to cover one or more cycles for cyclic processes. Incremental sampling provides the only approach to a complete determination of velocity and particulate loading distributions along a traverse. With increasing emphasis on improvement of gas cleaning equipment, this procedure may become a standard requirement.

30985 **APTIC NO. 53511**

Goodson, Louis H. and William B. Jacobs

DETECTION OF ORGANIC VAPOR CONTAMINANTS IN AIR. *(Insurance Inst. for Highway Safety, Washington, D. C.) U. S. Pat. 3,711,251. 6p., Jan. 16, 1973. 1 ref. (Appl. April 14, 1971, 18 claims).*

A highly sensitive process and apparatus for determining whether air in a region of interest contains organic vapor contaminants have been developed which meet the criteria of portability, economy, effectiveness, and capability of generating a measurable signal for readout purposes. The presence of an organic vapor contaminant in air is determined by combining the air suspected of containing such vapor with a reactive halogen compound to convert the organic contaminant to the corresponding, volatile, covalent halide; then removing vaporous, ionically bound reaction by products from the air; and then detecting the remaining covalent halide through the use of a halogen leak detector or other suitable halogen sensors. The process may proceed on a continuous or intermittent basis, and has general application with respect to the detection of alcohol, aldehyde or ketone vapor contaminants. Apparatus is particularly adapted to sample air which is or recently has been in close proximity to a subject person to determine if a sufficient concentration of ethyl alcohol vapor is present to indicate that the subject may be impaired by alcohol. (Author abstract modified)

30986 **APTIC NO. 53015**

Harney, Brian M., Donald H. McCrea, and Albert J. Forney

THE APPLICATION OF REMOTE SENSING TO AIR POLLUTION DETECTION AND MEASUREMENT. *Bureau of Mines Information Circ., no 8577:1-21, 1973. 40 refs.*

GPO

The technique of remote sensing has been applied to the detection and monitoring of air pollution. Instrumentation being developed is of a very diverse nature. It is effective, in varying degrees, at ranges from 1000 m to the altitude of a space satellite. A number of recent developments in this field are discussed including instruments based on spectroscopic, laser, and photographic systems. Sensors are being developed which utilize correlation spectrometry, correlation interferometry, interferometry, Raman scattering, Mie scattering, laser line absorption, and simple photographic detection. (Author abstract modified)

30987 **APTIC NO. 52691**

Hasegawa, Takahiko, Reiko Ichiji, and Mitsuru Niizeki

COLLECTION AND MEASUREMENT OF MERCURY IN AMBIENT AIR. *(Kankyo kichu suigin no hoshu to sokutei). Text in Japanese. Nagoya Daigaku Kankyo Igaku Kenkyusho Nenpo (Annu. Rep. Res. Inst. Environ. Med., Nagoya Univ., no. 24:201-204, March 1973. 3 refs.*

Sampling methods for mercury are described. Inorganic mercury can be determined by a 10% ascorbic acid solution used as a reducing agent. With 0.5-1.0 l/min suction speed, all the Hg was trapped in the first trap of the sampler; at 1.5-2.0 l/min, some Hg was detected in a second trap, indicating insufficient collection ability of the first trap due to the high flow rate. The Hg collection efficiency of potassium manganate, sulfuric acid, and hydrochloric acid were compared; KMnO4 was the best. Suction speed, temperature, and collection solution affect collection efficiency. For collection of Hg at a flow rate of 0.5-1.0 l/min, a KMnO4-H2SO4 collection solution gave a 99% collection efficiency. With higher concentrations of Hg, two or three stage trapping is needed. Several improvements are needed for continuous determination of Hg by ultraviolet spectrometry because the determination is influenced by the presence of organic solvents, aerosols, magnetic fields, and the base line drift of the instrument. Flameless atomic absorption spectrophotometry can be used for semi-continuous Hg measurement.

30988 **APTIC NO. 52663**

Hashizume, Tamaki, Go Kanamaru, and Teruyuki Tsujikawa

THE EFFECT OF THE CONDENSATION OF WATER ON THE DETERMINATION BY THE ALKALI FILTER PAPER METHOD. *(Arukari roshiho ni okeru suibungyoshuku nadono eikyoni tsuite). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 1:129-133, March 1973.*

Although the alkali filter paper method is convenient for measuring sulfur dioxide in air, the results sometimes differ from those by the lead dioxide method. The results of measurements at 17 sites in Yokkaichi city showed good correspondence between the values obtained by the two methods. However, filter paper method values were 10% lower than those obtained by the PbO2 method. Higher values were usually obtained with the filter papers placed in the lower position; lower values were obtained by the filters placed in the upper position. This is attributable to the condensation of moisture or downflow of water. When a special piece was installed to hinder the effect of moisture condensation, data became larger by about 10%. The correlation factor between the two measurement methods increased to 0.935 by this improvement.

30989 **APTIC NO. 52760**

Heintzenberg, Jost and Heinrich Quenzel

ON THE EFFECT OF THE LOSS OF LARGE PARTICLES ON THE DETERMINATION OF SCATTERING COEFFICIENTS WITH INTEGRATING NEPHELOMETERS. *Atmos. Environ., 7(5):503-507, May 1973. 4 refs.*

In ducts leading to nephelometers, the impact of large aerosol particles on the walls changes the scattering properties of the turbid air under investigation. The quantitative relationship between the upper boundary radius of the particles and the scattering coefficients or visibilities measured by the nephelometer is given for power law size distributions of the aerosol particles. It follows that the loss of large particles influences the measuring accuracy of nephelometers only slightly. No large additional errors are introduced by using closed measuring chambers for the determination of the scattering coefficient of turbid air containing dry aerosols. When nephelometers are enclosed at rather high relative humidities, the largest effects on the results are likely to be due to changes in relative humidity because of the corresponding changes in particle size. (Author abstract modified)

30990 **APTIC NO. 52825**

Heintzenberg, Jost and Heinrich Quenzel

CALCULATIONS OF THE DETERMINATION OF THE SCATTERING COEFFICIENT OF TURBID AIR WITH INTEGRATING NEPHELOMETERS. *Atmos. Environ., 7(5):509-519, May 1973. 15 refs.*

The theory for measurements with integrating nephelometers is presented in a form which is independent of the characteristics of individual instruments. Its application to two special instruments (Ruppersberg-Nephelometer and Charlson-Nephelometer) is considered with respect to the problem of calibration with scattering media of known scattering properties. Corrections of the calibration are given for a number of aerosol size distributions which may occur in the atmosphere. (Author abstract)

30991 **APTIC NO. 52668**

Hirobe, Hiroshi and Kunihiro Naka

THE ANALYTICAL DETERMINATION OF STYRENE. *(Suchiren no bunsekiho ni tsuite). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 1:94-98, March 1973.*

A sample gas was collected in a glass U-tube cooled with liquid oxygen, and condensed gases were allowed to evaporate into a gas chromatograph with a flame ionization detector where they were analyzed for styrene. Operating conditions are described. The measurements were made at 10 sites in a petroleum refinery. The highest styrene concentration was 0.81 ppm. The results did not necessarily agree with those obtained from a human odorimetry measurement of the styrene. Pollution by styrene is limited to a narrow range.

30992 **APTIC NO. 52824**

Horvath, H.

A SIMPLE METHOD FOR THE ABSOLUTE CALIBRATION OF THE INTEGRATING NEPHELOMETER. *Atmos. Environ., 7(5):521-525, May 1973. 7 refs.*

A different method for calibration is offered in analogy to the original calibration method of Beutell and Brewer (1949). Inserting a piece of opal glass in the scattering volume of the integrating nephelometer has proven to be useful for calibration of the instrument. The ratio of incoming illuminance and emitted luminance of the glass has to be known and can be determined easily by a simple experiment. By use of a proper color filter in combination with the opal glass its scattering properties can be matched to the scattering properties of the investigated aerosol with respect to wavelength. By proper choice of neutral density filters several calibration points within the measuring range can be established. The new procedure allows a rapid calibration of the instrument, since no filling with calibration gas is necessary.

30993 **APTIC NO. 53495**

Ikeda, Sanae, Junko Hirata, and Hiromu Satake

RAPID DETERMINATION OF SULFITE ION BY POTENTIOMETRIC ARGENTOMETRIC TITRATION USING IODIDE-ION SELECTIVE MEMBRANE ELECTRODE. *(Yokabutsu ion sentakumaku denkyoku o mochiita denisa tekiteiho ni yoru aryusan ion no shinsoku teiryo). Text in Japanese. Nippon Kagaku Kaishi (J. Chem. Soc. Japan), no. 8:1473-1477, 1973. 2 refs.*

Optimum conditions were established for sulfite ion determination by potentiometric argentometric titration using an iodide-ion selective membrane electrode. After 0.2 N iodine-methanol solution (1 ml) and 2 N sulfuric acid (1 ml) are mixed in a titration cell, a sulfite solution (e.g., 0.1 N, 10 ml) is added. The resultant solution is diluted to 100 ml with water and titrated potentiometrically with a silver nitrate solution. Sodium sulfate (0.00001-0.01 N as iodide ion) was determinable with a relative error less than -2.5% and a coefficient of variation less than 3%. The most precise determination was possible at the 0.01 N concentration. Thiosulfate and sulfide interfered with the titration, but the presence of large amounts of chloride, bromide, sulfate, and carbonate ions did not show any interference. The method is applicable to the determination of sulfur dioxide in chimney gases. Analytical values obtained with the method were in good agreement with those reported for the iodimetric method.

30994 **APTIC NO. 53234**

Jotaki, Tomosada

MEASURING TECHNIQUES OF FLOATING PARTICULATES (1). *(Fuyu funjin no sokutei gijutsu). Text in Japanese. Kikai no Kenkyu (Science of Machine), 25(7):888-892, July 1973.*

Methods of measuring particulates in stack gas are surveyed. The total stack gas flow rate is first measured by a numerical equation; then the flow rate in each section is calculated from the dynamic pressure in the Pitot tube and the specific gravity of the stack gas. The stack gas is then sucked into a dust tube at the same flow rate. Particulates are determined by the increase in the dust tube weight and by the amount of gas sucked in during a certain time interval. The stack gas must be sucked in at the same rate as the flow rate to avoid errors.

30995 **APTIC NO. 53480**

Konopczynski, Andrzej and Edward Prasek

METHOD OF COLLECTING, KEEPING, AND ANALYZING COMBUSTION GASES. *(Metoda pobierania, przechowywania i analizy gazow spalinowych). Text in Polish. Chem. Anal. (Warsaw), 18(2):397-405, 1973. 8 refs.*

A method for collecting, keeping, and analyzing the chemical composition of combustion gases emitted by internal combustion engines is described. Gas chromatography is used for determining individual components in the automotive exhaust. Exhaust samples must be taken at the same time for all interesting components, such as carbon dioxide, carbon monoxide, oxygen, hydrogen, and hydrocarbons (methane). The carrying gas used is argon. Sampling is done at exhaust pipe opening. The sampler is connected to a polyethylene tank. The latter is air tight; after closing the opening, the tank becomes a storage place, in which gases can be kept long enough for analysis purposes. The materials used should be acid resistant, and the gases should be cooled up to 10 to 20 Celsius. The condensation water and pollutants should be segregated. No changes are observed in the gaseous composition in the polyethylene tank even after 48 hours of storage. The accuracy coefficient is 5%. The concentrations of the various gases vary as follows: CO from 0.02 to 16%, H2 from 0.01 to 7%, and CO2 from 4 to 15.4%. The concentrations of the given gaseous components sampled on the same day for given engine working conditions vary from plus 2% to minus 2%, i.e., within the average measurement error limits of the gas chromatographic method. The apparatus proves its efficiency during repeated samplings and analyses of combustion gases. Descriptions of the apparatus, diagrams of gas concentrations, and photos of the apparatus are provided.

30996 **APTIC NO. 52841**

Lane, D. A., H. K. Moe, and Morris Katz

ANALYSIS OF POLYNUCLEAR AROMATIC HYDROCARBONS, SOME HETEROCYCLICS, AND ALIPHATICS WITH A SINGLE GAS CHROMATOGRAPHIC COLUMN. *Anal. Chem., 45(9):1776-1778, Aug. 1973. 17 refs.*

A gas chromatographic column packed with Dexsil impregnated asbestos cord was used for the separation and quantitative determination of common polycyclic hydrocarbons. Direct quantitative determinations were possible for all tested compounds except phenanthrene/anthracene, benzo(a)anthracene chrysene, and benzo(a)pyrene/benzo(e)p yrene pairs. Separation of the groups phenanthrene, anthracene; benz(a)anthracene, chrysene, and naphthacene; and benzo(k)fluoranthrene, benzo(a)pyrene, benzo(e)pyrene, and perylene was equivalent to that achieved with a glass capillary column. The detection limit of the flame ionization detector was 3-6 ng. Total separation of a mixture of 12 n-alkanes was also achieved with the column; hence, both qualitative and quantitative determinations can be carried out. These results indicate that the column is well suited to the analysis of the organic fraction of atmospheric particulates

30997 **APTIC NO. 53518**

Lee, Robert E., Jr.

MEASURING PARTICULATE MATTER IN AIR. *Preprint, American Society for Testing and Materials, 25p., 1973. 24 refs. (Presented at the American Society for Testing and Materials, Symposium on Instrumentation for Monitoring Air Quality, Boulder, Colo., Aug. 14-16, 1973.)*

The results obtained from measurements of the concentration and size of particulate matter in the air are dependent on the method used. Filtration samples in conjunction with gravimetric analysis, as exemplified by the high-volume air sampler and membrane filter sampler, represent the most commonly used technique in the United States. Both devices provide good measurement reproducibility, although neither is as accurate or reliable as would be desired. The spot tape sampler and smoke shade devices have value in assessing the soiling properties of particulate matter but are poor indicators of mass loading. Continuous monitors now available for measuring the concentration of atmospheric particulate matter appear promising, although further field testing is needed to assess their accuracy. Devices of this type include the integrating nephelometer, piezoelectric sensor, and Beta gauge. Devices are also available for determining the size distribution of particles by number or weight. A number distribution derived from a count of the particle population by optical, electric, or other methods is not equivalent to a weight distribution, which is usually determined from the aerodynamic properties of the particles. For routine field monitoring, the use of cascade impactors is preferable. The cascade impactor not only sizes the particles aerodynamically, but also collects particles for gravimetric and chemical analysis. Research studies that focus on the visibility reducing effect of suspended particles can better utilize devices that provide particle sizing data based on number rather than weight. (Author abstract modified)

30998 **APTIC NO. 52882**

Liang, S. F., C. V. Sternling, and T. R. Galloway

EVALUATION OF THE EFFECTIVENESS OF THE LEAD PEROXIDE METHOD FOR ATMOSPHERIC MONITORING OF SULFUR DIOXIDE. *J. Air Pollution Control Assoc., 23(7):605-607, July 1973. 7 refs.*

A simplified analysis to determine the variables that affect the empirical correlation factor used in the lead peroxide method for ambient sulfur dioxide monitoring is presented. The rate of sulfation was determined from two different models. In the first model, the mass transfer rate is calculated from the gas phase resistance alone while in the second model, the diffusion resistance in the gel phase is assumed to be the rate limiting step. Although the gas phase and the gel phase resistances may be both important in the actual case, the correlation factor based on the first model is adequate to describe general experimental observations. Reasonable agreement was obtained between the measured and the calculated value of the correlation factor. (Author abstract modified)

30999 **APTIC NO. 52886**

Liptak, B. G.

TRENDS IN ON-STREAM ANALYZERS FOR POLLUTION CONTROL. *Control Eng., 20(7):43-47, July 1973. 6 refs.*

On-stream analyzers and pollution monitors are now the fastest growing sector of process analysis instrumentation. Sampling problems plague the onstream analyzers, however, with the result that some 50% of installed analyzers either fail to perform satisfactorily or do not perform at all. This situation is remedied by development of probe type and flow-through type analyzers which do not require sample-handling components. Increasing stringent pollution and safety standards have spawned new analyzers that assist in both meeting and enforcing the standards. Ambient air quality monitors and atmospheric emissions analyzers are discussed. Analytical methods for sulfur dioxide, particulate matter, carbon monoxide, oxidants expressed as ozone, hydrocarbons, and nitrogen dioxide are pararosaniline colorimetric, gravimetric hi-vol sampler, non-dispersive infrared, chemiluminescent, flame ionization gas chromatography, and colorimetry, respectively.

31000 **APTIC NO. 53050**

Lisetskaya, G. S., N. S. Bilenko, and G. F. Bakal

DETERMINATION OF TETRAETHYL LEAD IN THE AIR OF INDUSTRIAL PLANTS. *(Opredeleniye tetraetilsvintsa v vozdukhe promyshlennykh predpriyatiy). Text in Russian. Gigiena i Sanit., no. 6:74-76, 1973. 3 refs.*

Sampling, extraction, and a colorimetric procedure for the determination of tetraethyl lead in the air of industrial plants is described. Air is sampled through three series of adsorbers containing activated and oxidized carbon as an adsorbent at a rate of 3 l/min. Tetraethyl lead is desorbed by means of ethanol, after which iodine crystals are added for oxidation, the solution is evaporated, and the residue obtained is dissolved in 6N-nitric acid. Following evaporation, 0.1 N nitric acid and bidistilled water are added, after which the solution is adjusted to pH 5 by means of ammonia. After the addition of distilled water and pH adjustment to 10, the solution is treated with a chloroform solution of dithizone. The optic density is determined at a wavelength of 508 nanom following phase separation.

31001 **APTIC NO. 53397**

Long, S. J., D. R. Scott, and R. J. Thompson

ATOMIC ABSORPTION DETERMINATION OF ELEMENTAL MERCURY COLLECTED FROM AMBIENT AIR ON SLIVER WOOL. *Preprint, American Chemical Society, 38p., 1973. 22 refs. (Presented at the American Chemical Society, National Meeting, 165th, April 1973.)*

A flameless atomic absorption method for analyzing elemental mercury collected on silver wool from ambient air is described. The system is designed to analyze ambient mercury levels from 15 ng/cu m to 10 micrograms/cu m by use of in series collectors for 24-hour sampling times. Analysis time is less than 5 min per collector. The use of a digital integrator rather than absorption peak heights to measure absorption time areas was investigated. The area measurements gave better precision at higher mercury concentrations and more useful calibration curves extending over wider ranges than did the peak height measurements. The calibration curves, obtained by syringe injection of air saturated with mercury vapor, extended from 0.5 ng to 594 ng and were reproducible to with 11% at 0.5 ng and within 3%, relative standard deviation, beyond 6 ng. The effects of analytical train flow rate were investigated, as were the capacity of the silver wool collectors and the temperature required to release the collected mercury from the silver wool. The ambient levels of dimethyl mercury, sulfur dioxide, hydrogen sulfide, and nitrogen dioxide did not seriously interfere with the collection or analysis procedures. High levels (microgram quantities) of chlorine poisoned the collectors and interfered with the analysis method. The detection limit was 0.3 ng at a 200/cc/min analytical flow rate. This corresponds to an aerometric limit of 2.1 ng/cu m mercury at a collection flow rate of 100 cc/min for a 24-hour sampling period. (Author abstract modified)

31002 **APTIC NO. 52889**

Masek Vaclav and Jan Neiser

CHROMATOGRAPHIC DETERMINATION OF PYRIDINE BASES IN THE AIR OF THE TAR AND PITCH INDUSTRY WITH THE AID OF ABSORPTION SOLUTIONS. *(Chromatische Bestimmung von Pyridinbasen in der Luft der Teer- und Pechindustrie mit Absorptionsloesungen). Text in German. Bitumen-Teere-Asphalte-Peche, 24(7):306-308, 1973. 3 refs.*

For quantitative determination of pyridines and some other low- boiling bases only chromatography is suitable. Pyridine bases could be more successfully absorbed in a solution of 5% citric acid and 0.2% n-butanol than in O.1 N sulfuric acid. With the aid of the scanning electron microscope JSM-U3, several three- dimensional photographs of smallest airborne dusts were taken. Three illustrations show respirable dust particles of mainly spherical shape. Mathematical evaluation of the results obtained with the two different absorption solutions revealed that the absorption in citric acid and butanol according to Forweg and Crecelius is on the average 39.1% more efficient than in O.1 N sulfuric acid. The absorption intensity from pyridine to 2.5 lutidin more than doubles. All interactions are linear on a high significance level (0.001 to 0.02).

31003 **APTIC NO. 52862**

Matousek, J. P. and K. G. Brodie

DIRECT DETERMINATION OF LEAD AIRBORNE PARTICULATES BY NONFLAME ATOMIC ABSORPTION. *Anal. Chem., 45(9):1606-1609, Aug. 1973. 8 refs.*

The direct determination of airborne lead particulates was performed by atomic absorption using nonflame atomization. Particulate matter was collected on a Millipore filter disk (pore size 0.22 micron) inserted in a modified graphite sampling cup. A 200 ml air sample was sufficient. Prior to analysis an excess of phosphoric acid was added to the sample to produce a single lead absorption peak. The absolute sensitivity achieved (for 1% absorption) was 1.7 times 10 to the minus 11th power g of lead which represents 0.1 microgram Pb/cu m for a 200 ml air sample. Aqueous lead solutions added to the standard graphite cup could be used for standardization. The relative standard deviation calculated for aqueous solutions (equivalent to 1 microgram Pb/cu m in air) was 4.2%. The results of lead measurements in the Melbourne metropolitan area are summarized. The range of the results is similar to those obtained by a number of methods at different locations. (Author abstract modified)

31004 **APTIC NO. 53573**

Matsugai, Takahiro

ANALYTICAL INSTRUMENT FOR SULFUR DIOXIDE AND ITS APPLICATION. *(Aryusan gasu bunseki sochi to sono riyo). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 40(8):760-764, Aug. 1973.*

The electroconductivity, infrared, and ultraviolet analyses of sulfur dioxide are discussed. The effect of interfering gases and chemical is discussed. The sampling system is important in obtaining correct determinations.

31005 **APTIC NO. 52677**

Matsui, Takaetsu and Hirohisa Shima

STUDIES ON SUSPENDED PARTICULATES. V. EXAMINATION OF HIGH VOLUME AIR SAMPLERS (THE EFFECT OF THE AIR AT THE OUTLET). *(Huyuhunjin ni kansuru kenkyu. V. Haiboryumu easanpura no kento (Toshutsu kuki no eikyoni tsuite). Text in Japanese. Mie- ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 1:55-59, March 1973. 2 refs.*

A high-volume air sampler equipped with a long exhaust pipe and one not equipped with the pipe were compared and showed little difference in the amount of total particulates. The sampler without the pipe gave higher values than the one with it by 10% for iron, lead, nickel, copper, and other metals. Little difference was noted for manganese and cadmium. These results showed that the air discharged from the outlet of the sampler is collected again at the inlet. Measurements were made in November 1970 in Yokkaichi when the wind velocity was between 0.7 and 3.8 m/sec with the two samplers 5 m apart. Particulates were continuously collected for 24 hr on a glass fiber filter. Pollution varied each day. Highest air pollution was on Nov. when the particulate concentration was as much as 528 micrograms/cu m by the sampler without a long exhaust pipe.

31006 **APTIC NO. 53174**

Mishima, Hideo, Shozo Yano, and Toshio Kawara

THE METHODS AND THE INSTRUMENTS SUITED FOR COLLECTION AND WEIGHING OF PARTICULATE POLLUTANTS. *(Baijin keisoku to sono shitsuryo sokutei sochi). Text in Japanese. Shimazu Hyoron (Shimazu Rev.), 30(1):69-74, 1973. 12 refs.*

A sampling method and measurement technique for particulate pollutants is outlined with reference to some of the Shimadzu balances specifically designed to permit rapid and reliable measurement of such pollutants. Diagrams are provided to illustrate dust sampling by a dust-tube, dust-tube construction, cascade impactor operation, disk filter holder and cylindrical filter holder construction, high volume air sampler operation, deposit gauge and dust-jar construction, dividing filter composition, impinger operation, and electric dust collector construction. Some of the Shimadzu devices pictured are: Shimadzu direct reading balance (NL., L., and LS series), the Shimadzu direct reading balance LP-1 for dust-tube, the Shimadzu direct reading balance SHP-2 for large filter, and the Shimadzu cascade impactors (CS-150 and CS-200).

31007 **APTIC NO. 52707**

Moriyama, Nobutaka

APPLICATION OF X-RAY FLUORESCENCE ANALYSIS TO POLLUTION CONTROL. *(Keiko X-sen bunsekiho no kogai boshi eno oyo). Text in Japanese. Kogai Boshi Sangyo (Environ. Pollution Control), 3(7):30-35, July 1973. 8 refs.*

The application of X-ray fluorescence to the determination of heavy metals, e.g., chromium, arsenic, cadmium, mercury, and lead, in particulate matter in air, river water, industrial waste water, soil, and foods and of sulfur in heavy oil was examined. The principles of operation and analytical techniques were reviewed, along with sampling and sample preparation. An automatic particulate sampling apparatus was developed for use in conjunction with X-ray fluorescence which allows the determination of 10 elements for each 100 samples.

31008 **APTIC NO. 52947**

Okamoto, Noboru, Hiroaki Utsumi, and Teruo Oba

DATA HANDLING SYSTEM CONCERNING EXHAUST EMISSIONS. *(Haigasu oyobi kakushu deta shori shisutemu). Text in Japanese. Meidensha Jiho (Meidensha Rev.), no. 109:30-33, March 1973.*

A computer incorporated data handling system has been developed for testing of fuels and lubrication oils and has successfully been put into practice. An automobile to be tested is set on a dynamometer, and the exhaust emissions and function of lubrication oils during operation of either gasoline or diesel driven engines are examined. Measurement and data handling are performed by means of a mini computer system which is designed to operate in five different functions such as recording of data in either long or short time operation, measurement of octane number, and automatic analysis of exhaust emissions in either four or seven-mode operation. In long time operation, data sampling can be done by either a constant time interval or by a constant mileage and arbitrary time interval. Twenty-six items such as speed, rpm, hp, fuel consumption and so on are recorded. In short time operation, data on starting, acceleration, and other transient characteristics are examined and the same items as in the long time operation are checked and recorded. In measurement of octane number during operation, when human response to a knocking sound is sent as a form of timing signal, the computer records the data required for octane number measurement. In either four or seven-mode operation, a car is driven following a driving pattern and the amounts of carbon monoxide, carbon dioxide, hydrocarbons,and nitrogen oxides in the exhaust emissions are automatically measured and recorded. The computer system consists of a minicomputer, system typewriter, a fast paper tape reader, a magnetic tape recorder, a logging typewriter, a process power supply, an operator box, and a cabinet. The system employs cassette type magnetic tape and party line.

31009 **APTIC NO. 52940**

Pacak, Petr and Mojmir Skokanek

SIMPLE DEVICE FOR THE CONTINUOUS DETERMINATION OF SOME GASEOUS REACTION PRODUCTS. *(Jednoduche zarizeni pro kontinualni stanoveni nekterych slozek v plynnych produktech chemickych reakci). Text in Czech. Chem. Listy, 67(4):433-436, 1973. 4 refs.*

A simple device designed for the continuous determination of chlorine, bromine, ozone, sulfur dioxide, hydrogen sulfide, and other substances by photometric analysis is described. A cylindrical glass container whose mouth is closed by a glass stopper and whose narrow lower part serves as a seat for a teflon mixing disc with the rotor shaft passing through the glass stopper holds a solution of potassium iodide, the gas mixture from a chlorine generating reactor oxidizing iodide to iodine enters the solution by a lateral polyethylene tube. An outlet at the bottom and an inlet at the side of the glass container permit circulation of the liquid through a photometric cell where the amount of the eliminated iodine is measured. The volume of the liquid in the system with a rotor velocity of 2000 rev/min passes through the cell once in 10 seconds. Determination is made at a wavelength of 540 nm. Results are entered on a logarithmic paper whose ordinate shows time in minutes and whose abscissa registers mol iodine times 0.0001. Calibration is obtained following termination of the experiment by titrating the total amount of iodine with a thiosulfate solution. The sensitivity of the method is governed by the thickness of the cell and by the volume of the potassium iodide solution in the system. Reducing gases are determined by substituting an iodine solution of known concentration for the iodide solution.

31010 **APTIC NO. 52814**

Park, D. and R. J. Bird

A SOLID INTERNAL STANDARD METHOD FOR X-RAY FLUORESCENCE SPECTROSCOPY AND ITS APPLICATION TO THE ANALYSIS OF LEAD IN GASOLINE. *J. Inst. Petrol. (London), 59(566):66-69, March 1973. 4 refs.*

In X-ray fluorescence analysis of liquids, a solid internal standard in the form of a parallel array of thin layers was tested for its ability to compensate for matrix variations. For the analysis of lead in gasoline, thin layers of the element of adjacent atomic number, bismuth, provide very good compensation. Results obtained with toluene and isooctane solutions were within 2% of lead content known from chemical analysis and blending. (Author abstract modified)

31011 **APTIC NO. 53219**

Raymond, A. and G. Guiochon

STUDYING A QUANTITATIVE ORGANIC VAPOR TRAP UNDER CONDITIONS OF THEIR PRESENCE IN TRACE AMOUNTS IN THE AIR OR IN LIGHT GASES. *(Etude d un piege quantitatif des vapeurs organiques a l etat de traces dans l air ou les gaz legers). Text in French. Analusis, 2(5):357-363, May 1973. 19 refs.*

Graphitized carbon can serve to advantage for the adsorption of organic vapors in the atmosphere without excessive condensation and hydrolysis. The inert adsorbent has high thermal stability, is non-selective, and its physico-chemical structure is well known. Adsorption is performed in a 5 cm stainless steel tube filled with graphitized carbon Sterling FTG; 0.25 . 0.4 g of the substance is held in place by glass wool stoppers. Sampling is accomplished by aspiration, the adsorbed products are transferred to the chromatographic column by heating the tube to 400 C for 10 minutes which will completely desorb all organic substances. The effectiveness of the method was tested using known quantities of dimethyl phthalate prepared in a glass diffuser at concentrations between 0.019 and 4.5 ppm. At least 87% of the phthalate was recovered even at the lowest concentrations of dimethyl phthalate which indicates that the method can be used for organic vapors of similar trace concentrations. The sensitivity limit corresponds to concentrations of an order of magnitude of 0.000000000001. A chromatogram made from 5 cu m atmospheric air identified 17 hydrocarbons, cyclical molecules or hydrocarbons with very ramified structures ere not retained as quantitatively as linear isomers.

31012 **APTIC NO. 52740**

Reckzeh, G. and W. Dontenwill

THE PROBLEM OF QUANTITATIVE DETERMINATION OF AIRBORNE MICROORGANISMS IN AIR CONDITIONING SYSTEMS AS FOUND IN A LABORATORY ANIMAL UNIT FOR RESEARCH BUILT ON THE BARRIER SYSTEM. *(Zur Frage der quantitativen Bestimmung von Luftkeimen in Klimaanlagen am Modell einer nach dem geschlossenen System erbauten tierexperimentellen Abteilung). Text in German. Zentralbl. Bakteriol., Parasitenk. Infektionskr. Hyg. Abt. 1 Orig., Reihe B, 157(2-3):227-256, 1973. 61 refs.*

Quantitative microbiological studies were conducted in clean rooms and on an airconditioning system of a barrier-type building for the maintenance of experimental animals, using Casella volumetric samplers in routine surveys; comparative examinations of simultaneously collected samples have been performed with sedimentation plates and Greenburg-Smith-impingers. The Casella volumetric sampler operates according to the impaction principle. The bacteria carrying particles were thrown from an accelerated airflow through a slit of 0.3 mm width and 28 mm length onto a rotating nutritive substance plate. The air throughput was 30 l/min. With the Greenburg-Smith- impinger, the air sample is accelerated in a capillary, the germs are thrown onto a glass plate, and the germs are collected in an absorption liquid. The air throughflow was 30 l/min. The germ concentration determined in empty rooms with the impingement method was two to six times higher than the concentration determined with the impaction method. The ventilating system may well be a source of microbial contamination of air. Inspection of the air supply system showed that viable contamination in the rooms behind the barrier was chiefly caused by increased numbers of bacteria in the air after passing the water spray humidifier, by leaks in the air ducts, and by negative pressure in the rooms compared with the clean corridor. After repair and additional installation of high efficiency particulate (HEPA) filters, the level of viable contamination could be drastically reduced in the rooms. Baseline studies of bacteria in the air of empty rooms resulted in 6.0-8.8/cu m. The mean bacteria count/cu m ranged from 19.3-77.2 in rooms with three to six persons present to 133.2-632.5 in the same rooms when occupied by animals. The airborne contamination was influenced by density and activity of personnel and animals, bedding of cages, and ventilation rates. Operation and maintenance of the air-conditioning system as well as contamination control measures are outlined, and methodical considerations of sampling procedures are discussed. Application of continuous operational surveillance, good housekeeping strictly controlled disinfection procedures, disciplined aseptic techniques, plus constant flushing of the rooms with sterile HEPA-filtered air will provide a practical method of achieving control of microbiological contamination. The mentioned methods should be applicable in a modified manner for contamination control of aseptic areas in hospitals and air conditioning system of hospitals.

31013 APTIC NO. 52739

Rotter, M. and W. Koller

SAMPLING OF AIRBORNE BACTERIA BY GELATINE-FOAM-FILTERS. *(Sammlung von Luftkeimen mit Gelatine-Filtern) Text in German. Zentralbl. Bakteriol., Parasitenk. Infektionskr. Hyg.:Abt. 1:Orig., Reihe B, 157(2-3):257-270. 1973. 10 refs.*

The properties of water soluble gelatine-foam-filters are investigated with regard to their suitability of collecting air borne bacteria in automatic samplers. In order to establish the optimal conditions for a uniform performance and the highest efficacy of these filters the following items were examined: Do viable counts obtained from groups of cultivated gelatine filters follow a Poisson-distribution, each group containing 10 of those and the filters having been exposed to identical conditions? How is the bacterial yield influenced by variation of: processing of the exposed filters, velocity of filtration, duration of filtration, storage of exposed filters, batches of filters of different age? The evaluation of the results of 264 filter groups, each group containing five filters, demonstrated that filters having been exposed to identical conditions led to viable counts which under certain conditions are well compatible with the assumption of a POISSON-distribution. When differences in the bacterial yields were found, they usually were not caused by the filters themselves but by different processing methods: lower counts on the average and greater scatterings were observed when the filters were dissolved in various fluids before cultivation than it was the case when the filters were placed upon blood agar plates directly. On the other hand, no different counts were observed between filters placed upon solid media solely and such which underwent the same treatment with successive spreading of the resulting melting-fluid. Yet the scattering of the counts was increased remarkably in the later case. A filtration-velocity of 20 cm/sec proved to result in the highest counts. The influence of the duration of filtration was striking: relative to the bacterial yield after filtration of 1 min a 5 min filtration led only to a bacterial yield of 78% and a 60 min filtration period only to the one of 55%. The storage of exposed filters reduced the yields as well: within the first 48 hours the viable counts fell to 76% and after 192 hours to 66% of the ones received when the filters were cultivated immediately after exposure. Neither the different age of the unexposed filters nor the use of various batches resulted in a significant difference of performance.

31014 APTIC NO. 52817

Saltzman, Robert S. and Elton B. Hunt, Jr.

A PHOTOMETRIC ANALYZER SYSTEM FOR MONITORING AND CONTROL OF THE H2S/SO2 RATIO IN SULFUR RECOVERY PLANTS. *ISA (Instr. Soc. Am.) Trans., 12(2):103-107, 1973. 5 refs. (Presented at the Instrument Society of America, Analysis Instrumentation Symposium, 18th, San Francisco, Calif., May 3-5, 1972.)*

The strong ultraviolet absorption characteristics of hydrogen sulfide and sulfur dioxide are used in an analyzer system developed for monitoring the ratio of their concentrations in Claus-type sulfur recovery plant tail gas. A 2:1 ratio of the concentrations of H2S to SO2 must be closely controlled for maximum sulfur yield and minimum SO2 emission in the stack gas. Two photometric analyzers and a steam-jacketed sample train designed for high tail-gas sample flow rates are used in this system. The signal output of one analyzer reads SO2 concentration directly, and a simple computer operating on this and the signal from the second analyzer yields the H2S concentration and the ratio. Potential interferences and calibration techniques are discussed. (Author abstract)

31015 APTIC NO. 52842

Sanders, R.

AUTOMATIC RECORDING TRANSMISSOMETER FOR ATMOSPHERIC ATTENUATION MEASUREMENTS AT 0.9 MICRON WAVELENGTH. *Opt. Laser Technol., 5(3):126-130, June 1973. 1 ref.*

The design and performance of a double-ended transmissometer that accurately records the frequency and magnitude of atmospheric attenuation due to mists and fogs is described. The transmissometer consists of four interconnected units: a transmitter with a GaAs lamp operating at 0.9 micron wavelength, a receiver incorporating a silicon photo-diode, an electronics unit, and a data logger. The electronics unit processes the received signal to provide an input to the data logger which records the signal level on magnetic tape. The transmission data, covering a 50 dB dynamic range, is recorded at 5-minute intervals. The system is battery operated and capable of unattended operation for 1 month. Measurements carried out for 1 year at an outdoor site in southern England show that scattering loss has a marked diurnal variation due to the frequent development of ground mist or fog at night, which clears shortly after sunrise. In foggy conditions, attenuation levels can fluctuate by 300 dB/km in a 5-minute period.

31016 APTIC NO. 53321

Sansom, Robert L.

EXHAUST GAS SAMPLING SYSTEM: CORRECTION. *Federal Register, 38(140):19683, July 23, 1973*

A correction is made to remove the Optional Continuous Sampling Line from Figure A74-1 in the miscellaneous amendments to the motor vehicle regulations published on June 28, 1973 (38 FR 17130). The preamble to those regulations, change no. 29 stated that the Optional Continuous Sampling Line was being removed from Figure A74-1 of those regulations, but the

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erroneously published diagram included the sampling line. Figure A75h1, in which the Optional Continuous Sampling Line was also to be removed, appeared correctly in the June 28, 1973 Federal Register publication.

31017 **APTIC NO. 52[illegible]44**

Scognamiglio, Agostino

CONSIDERATIONS ON THE OPACIMETRIC EVALUATION OF DIESEL ENGINE EXHAUST. *(Considerazioni sulla valutazione opacimetrica della fumosita allo scarico dei motori diesel). Text in Italian. Termotecnica (Milan), 27(3):157-165, March 1973. (Presented at the Congresso Nazionale ATT-L Aquila, 26th, Sept. 1971.)*

Tests were conducted at the Istituto Motori del CNR in Naples to compare measurement characteristics of the Hartridge, Utac Schlumberger, Tecneco-Msa, and the Bosch smokemeters which are used to measure smoke opacity of smoke plumes emitted by Diesels. Since the Bosch instrument measures opacity indirectly, only the three remaining instruments were used in tests in motion. Test results revealed that the Hartridge and Utac instruments furnish diagrams which in the beginning start below the zero line, which is caused by electrical effects of the microamperemeter and the photocell. The question arises whether these same effects do not distort the shape and peak height of the tracing. The Tecneco instrument did not show this defect. The tracings furnished by the three smokemeters differ in that while the Tecneco and Hartridge curves have substantially the same course, the Utac tracing manifests a triangular peak rounded out at the crest without indentations. Fumosity is basically dependent on the manner in which acceleration occurs. In order to obtain a true and comparable tracing, the manner of acceleration must be prescribed by any test norm in detail. Another observation resulting from the tests was that maximal opacity by the instruments was not recorded in the same phase, the Tecneco was ahead of phase, the Utac manifested a marked delay.

31018 **APTIC NO. 53257**

Seger, Guenter

APPLICATION OF LASER LIGHT SOURCES IN THE MONITORING OF THE AIR FOR PARTICULATE POLLUTANTS. *(Die Anwendung von Laserlichtquellen zur Kontrolle der Luft auf partikelförmige Verunreinigungen). Text in German. Messtech., 81([illegible]):142-148, May 1973. 8 refs.*

The measurement of particulate air pollutants by means of light scattering techniques is described. The theoretical basis for using laser as the light source derives from the Mie theory. This theory treats the scattering as an electromagnetic wave boundary value problem in which the scattered waves are determined by the condition that together with the incident plane wave, the appropriate boundary conditions at the surface of the sphere must be satisfied. Resulting from this concept, it is possible to formulate a correlation between the light scatter and the size of the particles. The laser source satisfies the conditions necessary, because of its high intensity, for the measurement of particles in heterogeneous aerosols by the [illegible] angle scatter. Laser can also be applied in [illegible] designed for measuring particle size in highly [illegible] aerosols. The determination of the size of water drops in a cloud can be carried out advantageously with laser using a cloud physics nephelometer. Equipment is described for the determination of size and concentration of the particles in air pollutants and for the generation of surface signals. The determination of specific deposits of particles in the pulmonary alveoli is possible. The use of a helium neon (HeNe) laser for continual monitoring of air pollutants is described.

31019 **APTIC NO. 52673**

Shima, Hirohisa, Takaetsu Matsui, Syuji Hayakawa, Sadanori Mizutani, Motohide Murata, Noriki Ito, and Katsumi Yoshida

STUDIES ON SUSPENDED PARTICULATES. I. ANALYSIS OF INORGANIC COMPONENTS. *(Huyuhunjin ni kansuru kenkyu. I. Mukisebun no bunseki). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 1:31-36, March 1973. 24 refs.*

The analysis of inorganic components of suspended particulates was studied using a filtration method. While it was possible to measure zinc, titanium could not be measured. Low temperature calcination of samples gave satisfactory results without volatilization of volatile metals, accompanied by removal of organic materials. The filtration method was not suitable for the determination of water-soluble components such as sulfates. The determination of vanadium by atomic absorption spectrophotometry did not give satisfactory results. Results of determination of manganese and copper by this method agreed well with absorption photometry results. Determination of lead by atomic absorption spectrophotometry, the calibration curve method, the standard addition method, and the extraction method gave similar results. A high-volume sampler equipped with a vertical sampler was used.

31020 **APTIC NO. 53514**

Shults, Wilbur D. and John R. Kuempel

ELECTROCHEMICAL AIR POLLUTION MONITORING DEVICE AND METHOD OF USE THEREOF. *(Atomic Energy Commission) U. S. Pat. 3,713,994. 10p., Jan. 30, 1973. 2 refs. (Appl. March 16, 1971, 8 claims).*

An electrochemical monitoring device has been provided for measuring air pollutants. A thin layer of electrolyte solution is exposed on one side to the atmosphere and on the other side to a mercury pool electrode. Electrochemical reactions which take place at the mercury electrode surface due to the presence of certain pollutants alter the current flow through the mercury pool at a given voltage, thereby providing an indication of the amount of the particular pollutant under study. Since certain important pollutants undergo electrochemical reactions with mercury at different potentials and other pollutants react chemically with mercury, several methods of operation can be used. In one method, selective current responses are obtained for the detection and determination of different pollutants by varying the mercury electrode potential. In a second method, the products of chemical or electrochemical reaction are accumulated in the thin layer of solution or at the electrode surface, and are periodically determined by current coulometric measurement. These two methods can be used jointly and supplement each other. (Author abstract)

31021 **APTIC NO. 52860**

Soliman, J. I. and S. A. Al-Bermani

COMPUTER CONTROL OF DIESEL ENGINES FOR POLLUTION TESTING. *J. Automotive Eng., 4(3):10-16, June 1973. 18 refs.*

A system for the dynamic computer control of heavy duty diesel engines can deal satisfactorily with dynamic tests, such as the Federal three-mode test for smoke emissions, requiring fast and accurate response of the engine speed and its throttle position. The use of local three-term analog controllers facilitates fast changes of the controller parameters (e.g., gain, rate, and reset) without the need to change the software of the digital computer. Optimum values of controller parameters are, of course, dependent on the engine and dynamometer characteristics and are expected to change when a different engine is tested or when another dynamometer is used. Other tests under digital computer control are the Economic Commission of Europe (ECE) acceleration test for smoke emissions and the British initial and final performance tests for smoke emissions. Tests under analog computer control are the British 100 hr and ECE steady speed tests for smoke emissions and U. S. Federal (21-mode) and California (13-mode) tests for exhaust gas emissions. (Author conclusions modified)

31022 **APTIC NO. 52943**

Syty, Augusta

DETERMINATION OF SULFUR DIOXIDE BY ULTRAVIOLET ABSORPTION SPECTROMETRY. *Anal. Chem., 45(9):1744-1747, Aug. 1973. 23 refs.*

A rapid and specific atomic absorption spectrophotometric determination of sulfur dioxide requires minimal sample treatment and offers considerable freedom from interference. Sulfur dioxide, trapped by tetrachloromercurate solution, is released by treatment with sulfuric acid. It is then carried by a stream of carrier gas (nitrogen or compressed air) to a flow-through absorption cell, and ultraviolet absorption of the gas stream is measured at 215 nm. Laboratory tests showed that the method is less sensitive than the pararosaniline colorimetric method but much more sensitive than titration methods. The sensitivity limit of the absorption method is 4 micrograms SO2; with 250 micrograms or more SO2, the average deviation is less than 2.5%. No interference was observed with sulfate, sulfide, thiocyanate, nitrogen dioxide, carbon dioxide, or hydrogen sulfide. The method is being tested for the analysis of flue gases from coal-burning furnaces and for the analysis of solutions encountered in the paper manufacturing process.

31023 **APTIC NO. 53176**

Takahashi, Seiji, Takeshi Murata, and Tsunezo Takeda

ANALYSIS OF AIR POLLUTANTS BY GC-MS COMBINED SYSTEM. *(GC-Ms ni yoru taiki osen busshitsu no bunseki). Text in Japanese. Shimazu Hyoron (Shimazu Rev.), 30(1):33-39, 1973. 9 refs.*

A combined system of gas chromatography and mass spectrometry was employed in the analysis of air pollutants such as aldehydes, amines, sulfides, lower fatty acids, and hydrocarbons. The concern of the investigation was to determine the identity of atmospheric pollutants and the state in which they exist, since air pollution often results from the interaction of various compounds. Mass fragments are given for acetaldehyde, acrolein, methyl amines, diethyl amines, triethyl amines, trimethyl amines, acrylnitrile, ethylnitrile, vinyl acetonitrile, butylnitrile, dimethyl sulfides, and dimethyldisulfide. Mass spectra are furnished for methyl amine, dimethyl amine, trimethyl amine, nitrile compounds, sulfur compounds, and butyric acid; a comparison of the mass spectra for aldehydes and hydrocarbons is also illustrated. Analysis recordings are supplied for aldehyde, aqueous solutions of various amines (including trimethyl amines by Porapak N column), free lower fatty acids, and hydrocarbons concentrated by low temperature adsorption method. Mass fragmentograms are illustrated for trimethyl amines (m/e 58, 59, 60), and chromatograms are given for a 0.01% aqueous solution of trimethyl amines and a mixture of amines and sulfides.

31024 **APTIC NO. 52758**

Tamori, Ikuo, Masashi Matsumoto, Nobuyuki Kogure, Keigo Nakamura, and Kazaunari Imagami

ADSORPTION OF SULFUR OXIDES ON GLASS FIBROUS FILTER PAPER. *(Garasu seni roshi ni taisuru io sankabutsu no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 8(2):106-112, June 1973. 5 refs.*

The effects of sulfur oxides on cylindrical filter paper applied in measuring dust concentrations in stack gas were experimentally analyzed. The filter papers were borosilicate glass fibrous filter and silica glass fibrous filter. Test conditions were as follows: sulfur dioxide concentrations balanced by nitrogen gas, 1000 and 2000 ppm; reaction temperatures, 100-400 C and room temperature; gas flow rates, 0.35 and 0.07 l/min. The amount of SO2 adsorbed on fibrous filter paper was measured with a thermobalance analyzer. Adsorption of SO2 on the borosilicate glass fibrous filter increased with increase in gas temperature and supply time and with decrease in flow rate. The increase in adsorption was not negligible compared with the mass of sampled dust; and SO was irreversibly adsorbed. Adsorption of SO2 on silica glass fibrous filter was not increased.

31025 **APTIC NO. 53061**

Tomb, Thomas F. and Morton Corn

COMPARISON OF EQUIVALENT SPHERICAL VOLUME AND AERODYNAMIC DIAMETERS FOR IRREGULARLY SHAPED PARTICLES. *Am. Ind. Hyg. Assoc. J., 34(1):13-24, Jan. 1973. 16 refs.*

Airborne particles are often classified according to their equivalent volume diameter using the Coulter counter. Recently enacted regulatory health standards required that airborne particulate matter be classified according to their aerodynamic size. The relationship between these two different size parameters was determined for coal, limestone, and mica particles by comparing respective aerodynamic diameters (Stokes diameter, Ds) and equivalent spherical volume diameters (Dv) measured with the Coulter counter. The Dv/Ds relationships derived were about equal to 1.0 for the coal and limestone and 1.3 for the mica particles. Results indicated that with the coal and limestone particles investigated, Dv is a good measure of Ds. The platelet mica particles, representing the case of extreme particle shape, were associated with disparity of 30% between Dv and Ds; however, this was in close agreement with an experimentally determined and theoretically verified shape factor for oblate ellipsoids. (Author abstract)

31026 **APTIC NO. 52687**

Uehara, Hiromichi

A NEW METHOD OF DETECTING THE NO AND NO2 IN POLLUTED AIR -- DETERMINATION BY MEANS OF EPR GAS. *(Osen kukichi no issankachisso, nisankachisso no atarashii kenshutsu-ho -- Kitai EPR ni yoru teiryo). Text in Japanese. Gendai Kagaku (Mod. Chem.), 28(7):10-18, July 1973.*

A method of measuring nitric oxide and nitrogen dioxide with quartz cell inserted in a Zeeman Modulation Cavity Resonator using electron paramagnetic resonance is discussed. The detecting sensibility is 10 ppm, but improvement of the equipment can raise the detection level to 1 ppm. The adsorption sampling method is described. When 500 cu cm samples are used, the detecting sensibility for NO is 0.03 ppm. When the concentration of NO2 is less than 10 ppm, the NO2 is concentrated for detection by being solidified at a low temperature.

31027 **APTIC NO. 52896**

Uporova, G. I. and S. Yu. Shtiler

DETERMINATION OF DICOTEX IN THE AIR BY MEANS OF THIN-LAYER CHROMATOGRAPHY. *(Opredeleniye dikoteksa v vozdukhe metodom tonkosloynoy khromatografii). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 5:54-55, 1973. 4 refs.*

Specific, thin-layer chromatography for the determination of dicotex, an organochlorine herbicide, in the air is described. A total of 20 to 30 l of air is sampled at a rate of 1 l/min through absorbing cotton and silica gel; the dicotex is extracted by means of chloroform. The extract is then purified with concentrated sulfuric acid, after which the extract is distilled, and the resulting dry residue is dissolved in chloroform. The solution is applied on a thin layer of silica gel, using glacial acetic acid as a visualizing agent. Quantitative determination is done by comparison of the color intensity of the spots with that of a standard solution. Gray to black spots appear on the silica gel layer with ultraviolet irradiation. The sensitivity of the method is 1 microgram in the sample.

31028 **APTIC NO. 53300**

Vol berg, N. S., A. S. Zajcev, W. Warmbt, J. Macner, and S. Mladenov

RESULTS OF INTERNATIONAL COMPARISON MEASUREMENTS CARRIED OUT BY MEANS OF AUTOMATIC SULFUR DIOXIDE ANALYZERS IN LENINGRAD, 1970. *(Ergebnisse der Internationalen Vergleichsmessungen mit automatischen Gasanalysatoren fuer Schwefeldioxid -- Leningrad 1970). Text in German. Z. Meteorol., 28(7/8):215-224, 1973. 8 refs.*

Results of a comparative study of sulfur dioxide in the air as measured by different gas analyzers are reported. The testing was carried out in Leningrad between July 25 and Aug. 10, 1970. The following instruments were compared: the Palmer analyzer, used in England; a modified Novak gas analyzer for SO2 and a MO-DK gas analyzer, used in Germany; the GKP-I gas analyzer, used in the USSR; and the Novak gas analyzer and coulograph used in the CSSR. As a reference standard, a laboratory apparatus was developed which could measure a mixture of SO2 in air, under constant experimental conditions, over a long period of time. The different instruments were tested for the stability of the baseline null point over 24 hours, by the introduction of pure air; all the instruments proved to be stable with little or no deviation from zero. Further testing included: SO2 measurements obtained under conditions of the introduction of a constant concentration of SO2; determination of the time interval between the beginning of the reaction and the obtaining of the result; and a control of the linearity of the results obtained in terms of SO2 concentration. Comparison of the gas analyzers under natural conditions was then conducted in Leningrad for a period of 5 days. The characteristics considered under these conditions were the mean SO2 concentration for 12 hours and the maximal and minimal concentrations over 12 hours. The mean concentrations between the different instruments varied very slightly, on the order of 0.01-0.03 mg/cu m. It is suggested that such analyses can prove to be of practical use in modifying and improving instruments used for such measurements.

31029 **APTIC NO. 53065**

Wood, O. Lew and Carl H. Erickson

SIZING OF ATMOSPHERIC PARTICULATES WITH A HIGH VOLUME CASCADE IMPACTOR. *Chemosphere, 2(2):77-84, 1973. 11 refs.*

The development of a high-volume cascade impactor which is common use for air sampling is described. The impactor has a sampling rate of 20 cu ft/min and can be powered by high volume blowers. With this impactor, it is now possible to collect enough samples of atmospheric particulates in a 24-hour period to conveniently determine an aerodynamic size distribution of suspended particulates via gravimetric analysis. The impactor has four stages and an after-filter and separates particles from the air stream by inertial impaction. The effective cutoff diameters for the stages are 7.0, 3.3, 2.0, and 1.1 micron. The after-filter traps the submicron material. (Author abstract)

31030 **APTIC NO. 53175**

Yano, Shozo, Hiroshi Shirahase, and Tokiyasu Shintani

SHIMADZU DUST METER DUSTER-2000 SERIES. *(Shimazu roshi jinaikei DUSTER-2000 shirizu). Text in Japanese. Shimazu Hyoron (Shimazu Rev.), 30(1):75-79, 1973. 4 refs.*

An outline of the law and regulations related to particulate matter in the atmosphere is presented along with the principle, performance, and data of the Shimadzu dust meter (DUSTER-2000). Graphic representations are supplied for the separation characteristic of two-dimensional slit, zero point shift of the DUSTER-2000, relation between suction time and indication value, light wavelength characteristics, flowmeter characteristics, and measuring data of the DUSTER-2000. A flow sheet for the low volume air sampler and the Shimadzu dust meter is also provided.

31031 **APTIC NO. 52658**

Yasushi, Hasegawa, Kunihiro Naka, and Hiroshi Hirobe

STUDIES ON THE MEASUREMENT OF LOWER ALDEHYDES. *(Teikyuarudehidorui no sokutei ni kansuru kenkyu). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 1:99-107, March 1973. 4 refs.*

Aldehydes were measured with a gas chromatograph. By improving the condensing tube, it became possible to collect the aldehydes at very humid conditions. Interference from other substances was negligible. Measurements were made in an acetaldehyde plant. Especially high values of acetaldehyde (2368 ppb) occurred one morning above the battery limit of an n-butanol plant. The concentration of acetaldehyde above the battery limit of the acetaldehyde plant was lower than that above the n-butanol plant. The same tendency was found with n-butyl aldehyde and propionaldehyde, which indicates that the purging at the n-butanol plant largely contributes to pollution. Loading of trucks also increases aldehyde concentrations.

1972

31032 **APTIC NO. 53152**

PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio

FIELD OPERATIONS GUIDE FOR AUTOMATIC AIR MONITORING EQUIPMENT. *Office of Air Programs Contract CPA-70-124, Pub-APTD-0736, 163p., Oct. 1972. 34 refs.*

NTIS: PB 204650

The role of air quality monitoring, design considerations for automatic monitoring systems, calibration and response checks, operation and data logging, maintenance procedures, and air monitoring characteristics are discussed. Three appendices cover compilation of monitors, primary and secondary air quality standards, and conversion tables for useful parameters. Design considerations include the number of monitoring sites, site selection, population density, location of emission sources, meteorlogy, topography, site description, shelter design, mobility, neighborhood factors, physical requirements, cost estimates, sample manifold design, remote station support equipment, selection of monitors (e.g., conductivity, colorimetry, coulometry, flame photometry, flame ionization, nondispersive infrared photometry, and nephelometry), installation of monitors, and preparation and storage of reagents. Field application of dynamic calibration employing standardized permeation tubes and portable dilution equipment is extensively covered with the assistance of diagrams. Data logging for manual, semiautomated, and computer controlled systems is explained and exemplified by the use of check lists and log forms. Troubleshooting procedures guide the technician in maintaining electronic, mechanical, chemical, and optical subsystems. Finally, definitions are supplied for various physical characteristics, measurement principles, and performance characteristics.

31033 **APTIC NO. 53383**

McCrone (Walter C.) Associates, Inc., Chicago, Ill.

PROTOTYPE CONSTRUCTION AND FIELD DEMONSTRATION OF THE PARALLEL CYCLONE SAMPLING TRAIN (FINAL REPORT). *Environmental Protection Agency Contract 68-02-0258, EPA-R2-73-220, 28p., Dec. 15, 1972.*

NTIS PB 221291

Prototype construction and field demonstration of a parallel cyclone sampling train indicated that the sampler was capable of providing sufficient data to establish particle size distribution of an aerosol, though the application of the sampler was limited by sampling time. Pressure drop across the back up and by-pass filters developed quickly, and a constant flow rate through each cyclone was maintained only in the first few minutes. Hence, if gravimetric analyses are desired, extended sampling times might be necessary, and the sample would therefore lose its accuracy in such instances. The best way to extend the sampling time would be to enlarge the filter holders from the present 47 mm to 3 in. Reproducibility of cyclone collection efficiency data was not very good due to the limitation of three test runs. A more complete set of calibration experiments to measure the collection efficiency of each cyclone is recommended since the establishment of particle size distribution depends very much on the actual cut-off size of each cyclone. (Author summary modified)

31034 **APTIC NO. 53410**

Altshuller, A. P.

ANALYTICAL PROBLEMS IN AIR POLLUTION CONTROL. *Environmental Protection Agency, Washington, D. C., Office of Monitoring, Proc. Environ. Qual. Sensor Workshop, Las Vegas, Nev., 1971, p. II-44 to II-86, Jan. 10, 1972. 141 refs. (Nov. 30-Dec. 2.)*

Analytical problems in air pollution control are discussed in terms of instrumentation for measuring atmospheric gases, vapors, and particles, elemental analysis, anion analysis, measurement of organic particulates, stationary source emission measurements, and mobile source emission measurements. Instruments have been developed which are now receiving or have received field evaluation for sulfur oxides, ozone, carbon monoxide, and nitrogen oxides; an improved technique for determination of non-methane hydrocarbon has also been developed. Correlation spectrometers have been evaluated in several cities for long-path measurement of sulfur dioxide and nitrogen dioxide, using near-ground-level paths with two-ended system utilizing active sources of energy. An ideal open-path system of choice might involve a pulsed signal with ranging capability. A lidar-type system of this sort has received some evaluation by several groups for estimating total particulate loadings in the atmosphere. Remote optical instrumentation mounted in aircraft has several applications but is limited by aerosol scattering. Satellites may have eventual utility for measuring long-lived pollutants such as carbon monoxide and submicron particulates on a global scale, although adequate measuring techniques are still lacking at the present. No methods are available that have satisfactory specificity for hydrochloric acid, chlorine, or nitric acid. The great bulk of available particulate measurements have been obtained by collecting samples on filters in the field and then weighing and analyzing the collected sample in the laboratory. The use of high molecular weight fuels presents a special problem for analytical chemistry with respect to the actual form of the higher molecular weight products upon emission.

31035 **APTIC NO. 53409**

Barth, D. S. and S. D. Shearer, Jr.

MONITORING NEEDS FOR AIR POLLUTANTS AND SYSTEMS REQUIRED TO MEET THOSE NEEDS. *Environmental Protection Agency, Washington, D. C., Office of Monitoring, Proc. Environ. Qual. Sensor Workshop, Las Vegas, Nev., 1971, p. II-8 to II-22, Jan. 10, 1972. 7 refs. (Nov. 30-Dec. 2.)*

Some of the principal kinds of sensors available for monitoring air pollutants are discussed with particular attention given to remote sensing devices. Factors to be considered in the evaluation of either remote or traditional sensors are: specificity, sensitivity and range, stability, precision and accuracy, sample averaging time, reliability and feasibility, zero drift and calibration, response and lag time, rise and fall time, ambient temperature and humidity, maintenance requirements, and data output. The current state of the art in traditional air pollutant monitoring is given in tabular form for the following applications: mapping and definition of special problem areas, mapping and general survey for sulfur dioxide, integrated quantification of suspended particulates, integrated quantification of gases, relative soiling index, continuous analysis of gaseous pollutants, and continuous analysis of soiling rate. Some of the major considerations in remote sensing are covered by the following tables: qualitative comparison among spectroscopic instruments for the detection of pollutants from satellites, the advantages and disadvantages of spectral regions from the ultraviolet to infrared regions, remote sensor satellite/aircraft applications, and details on the detection of pollutants by absorption of laser radiation. It is emphasized that the development and use of remote sensors must be tied very closely to the monitoring and surveillance needs in order to insure that valid and useful data result.

31036 **APTIC NO. 52955**

Biller, William F., Michael Manoff, Jyotin Sachdev, William C. Zegel, and David T. Wade

MATHEMATICAL EXPRESSIONS RELATING EVAPORATIVE EMISSIONS FROM MOTOR VEHICLES WITHOUT EVAPORATIVE LOSS-CONTROL DEVICES TO GASOLINE VOLATILITY. *Preprint, Society of Automotive Engineers, Inc., New York, 25p., 1972. 11 refs. (Presented at the Society of Automotive Engineers, National West Coast Meeting, San Francisco, Calif., Aug. 21-24, 1972, Paper 720700.)*

The effects of fuel volatility characteristics on evaporative emissions from motor vehicles without evaporative loss-control devices were studied. The ultimate objective of this study was to derive a simple mathematical expression relating evaporative emissions from an urban car population to gasoline volatility parameters. Since development of the necessary data base for such a program through direct experimentation was inefficient, an alternate approach was taken in deriving a set of mathematical models to calculate evaporative emissions from carburetors and fuel tanks of motor vehicles. These models were verified by comparison with limited experimental data. Information available on daily urban area vehicle use and data on how fuel system temperatures vary with vehicle, vehicle use, and ambient temperature were used to develop a general model that would calculate daily evaporative emissions from a vehicle population, given the ambient temperature conditions and fuel volatility parameters. Linear regression analyses on these calculated data resulted in a mathematical expression for predicting the daily average evaporation emission from motor vehicles. Such an expression is of interest in studying the effects of changes in gasoline volatility characteristics on evaporative emissions from uncontrolled motor vehicles. (Author abstract)

31037 **APTIC NO. 53448**

Brennan, George Andrew

AIR POLLUTION DETECTORS. *(Assignee not given.) U. S. Pat. 3,698,871. 4p., Oct. 17, 1972. 6 refs. (Appl. April 16, 1970, 11 claims).*

A device consisting of a mast and flag capable of orienting itself to prevailing wind currents and having a known pollutant related decay behavior has been developed to monitor relative amounts of air pollutants contained in the effluent from a flue stack, for example. The indicator surface material and graduated markings are on the internal surface of a conical nozzle-like unit, suited to be mounted at the discharge end of an effluent duct, in an essentially horizontal position, with the flaring end of the conical unit in a terminal position and suited to the visual inspection of the internal surface. The preferred form of the invention consists of an aluminum tubular mast about 1.5 ft in diameter and approximately 6 ft long. This is painted with a white lead carbonate pigmented linseed oil based paint. Bands of bright metallic brass pigment in a clear acrylic resin lacquer are applied to give alternate bands of white and gilt. The device also permits general inspection of air pollution from a low flying aircraft or surface vehicle. The device records thypresence of pollutants by accumulation on or eroding of the surface of the indicator.

31038 **APTIC NO. 53184**

Charlson, Robert J. and Norman C. Ahlquist

METHOD AND APPARATUS FOR MAKING IN-SITU DETERMINATION OF THE CHEMICAL PROPERTIES OF ATMOSPHERIC AEROSOLS. *(Battelle Development Corp., Columbus, Ohio) U. S. Pat. 3,700,333. 18p., Oct. 24, 1972. 11 refs. (Appl. Feb. 4, 1971, 14 claims).*

An integrating nephelometer which provides an output signal proportional to the value of the extinction coefficient due to light scattering for a given sample of an atmospheric aerosol is described. A method for determining chemical and other properties of the aerosol sample using this nephelometer includes the steps of continuously varying some physical parameter of the aerosol sample while observing any change in the output signal provided by the nephelometer. In each case, a characteristic curve for the aerosol may be recorded over a range of values of the physical parameter, which identifies one or more properties of the aerosol, such as deliquescence, hygroscopicity, chemical composition, and aerosol particle size distribution. In one embodiment, the presence of deliquescent materials is ascertained by continuously varying the aerosol's relative humidity below a value of 100% while simultaneously recording the value of the nephelometer output signal and noting any discontinuities in the resultant recording. To obtain a clue as to the particular deliquescent material present in the aerosol, the relative humidity is increased within a given range, and the exact relative humidity at which a first discontinuity in the recording occurs is noted. To obtain an indication of the size distribution of the particles comprising the deliquescent aerosol, the relative humidity is further increased, and the exact relative humidity at which a second discontinuity occurs is noted, and the slope of the characteristic curve between the first and second discontinuities is calculated. By comparison of the first discontinuity and slope with those of predetermined reference curves, information as to the particular deliquescent material and its size distribution may be obtained. The method is also applicable to hygroscopic materials and to other combinations of a reagent, physical parameter, and aerosol sample. Embodiments of an apparatus for continuously varying the aerosol's relative humidity are also described. (Author abstract modified)

31039 **APTIC NO. 53186**

Davis, Robert

GAS ANALYZER. *(Combustion Equipment Associates, Inc., New York) U. S. Pat. 3,700,411. 6p., Oct. 24, 1972. 7 refs. (Appl. April 30, 1971, 10 claims).*

A gas analyzer especially suitable as a portable analyzer to accurately measure the quantity of pollutants in the air is described. Means are provided for accurately sampling a predetermined quantity of air for highly accurate reproducibility of results. The pollutants to be measured are dissolved in a fluid and the conductivity of the fluid is measured and correlated to the quantity of pollutants in the air. Design criteria of the analyzer is given. (Author abstract modified)

31040 **APTIC NO. 53207**

Davis, Roger C.

ELECTRO-OPTICAL VEHICLE EXHAUST PARTICULATE MONITOR. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,700,330. 5p., Oct. 24, 1972. 1 ref. (Appl. Oct. 13, 1971, 3 claims).*

A device for measuring the particulates entrained in a gaseous stream is described. The device includes a rotating transparent cylinder through which the gases pass, a supply of dry ionized air for admixture with the gaseous stream to change the particles entrained in the stream, and a pair of electrodes adjacent to the rotating cylinder for establishing an electrostatic field to precipitate the particles onto the cylinder wall. An optical scanning device then measures the collected particulate according to the attenuation of light beams passing through the cylinder wall. A design of the device is included. The device has a sufficiently large gas flow capacity so that it is not restricted to small samples. It is not subject to errors caused by water vapor condensate. (Author abstract modified)

31041 **APTIC NO. 53194**

Elliott, William G.

DEVICE FOR GAS ANALYSIS. *(SpectraMetrics, Inc., Burlington, Mass.) U. S. Pat. 3,651,322. 5p., March 21, 1972. 4 refs. (Appl. May 6, 1970, 30 claims).*

A spectrometric gas analysis device is described. The device comprises a housing with a heated element and a gas therein as the source of radiation and a detector for the emitted radiation. A chopper or other means are employed to permit the emission from the element and the gas to fall alternately on the detector. In an alternate embodiment, the gas in the source is of known emission characteristics and a gas to be analyzed is interposed between the source and the detector. (Author abstract modified)

31042 **APTIC NO. 53446**

Gant, Preston L.

PROCESS FOR THE TRAPPING OF MERCURY VAPORS AND APPARATUS THEREFOR. *(Continental Oil Co., Ponca City, Okla.) U. S. Pat. 3,693,323. 5p., Sept. 26, 1972. 7 refs. (Appl. Dec. 30, 1970, 6 claims).*

An improved process and apparatus for the collection of mercury vapors from a volume of air or other gases for its subsequent measurement is presented. The improvement comprises the direct resistance heating of a noble-metal absorbent in a mercury trap to release absorbed mercury for its subsequent measurement. The apparatus requires only a small amount of power for the desorption of the collected mercury on the absorbent material which allows for its use in a light aircraft. This device also could be incorporated into a multitrap system for continuous operation of collecting and measuring mercury content in air.

31043 **APTIC NO. 52629**

Giang, Benjamin Yunwen

DEVELOPMENT OF A GAS CHROMATOGRAPHIC DETECTOR SELECTIVE FOR FLUORINE-, CHLORINE-, AND SULFUR-CONTAINING COMPOUNDS, USING ION SELECTIVE ELECTRODES. *California Univ., Davis., Dept. of Agricultural Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 139p. 141 refs.*

A highly selective potentiometric gas chromatographic detection system for the analysis of fluorine-, chlorine-, and sulfur-containing compounds was developed and tested. The essential units include a common flow-through unit equipped with an ion selective sensing electrode and a reference electrode located slightly downstream. The design and operation variables are examined. The system was tested with aqueous standard solutions and gas samples. The minimum detectable amounts were about 3.4 micrograms of fluorine for each compound, 135 ng of chlorine, and about 1.0 ng of sulfur. The application of the system to the detection of pesticide residues was investigated.

31044 **APTIC NO. 53008**

Jackson, Gaines B., Robert T. Clancy, and Ruben D. Wende

A TENTATIVE DIRECT COLORIMETRIC METHOD FOR AQUEOUS SULFITE SUITABLE FOR ATMOSPHERIC ANALYSIS OF SULFUR DIOXIDE. *Health Lab. Sci., 9(2):152-160, 1972. 28 refs.*

A colorimetric/spectrophotometric method for the determination of sulfur dioxide based on its reduction properties on ferric iron is proposed. The method uses simultaneous complexation of the ferrous iron produced with a highly water soluble reagent, which has a high degree of selectivity for ferrous iron. The reagent is the disodium salt of 3-(2-pyridyl)-5,6-bis(4-phenylsulfonic acid)-1,2,4-triazine (ferrozine), which forms a highly colored magenta Fe(II) complex between the pH values of 4 and 9 and has an absorption maximum at 562 nm where the molar extinction coefficient is 27,900. The method was rapid and reliable, as well as more sensitive and less seriously affected by temperature than existing methods. Absorbance is proportional to the concentration of sulfur dioxide (from an aqueous sulfite solution). The reduction of ferric iron in the presence of acetate ion and ferrozine by sulfur dioxide and the formation of the Fe(II) complex depends on the ratios of ferrozine to ferric iron, ferric iron to sulfur dioxide, temperature, and the nature of the buffer and the hydrogen ion concentration of the system.

31045 **APTIC NO. 53398**

Jaklevic, Joseph M. and Fred S. Goulding

SEMICONDUCTOR DETECTOR X-RAY FLUORESCENCE SPECTROMETRY APPLIED TO ENVIRONMENTAL AND BIOLOGICAL ANALYSIS. *IEEE (Inst. Elec. Electron. Engrs.) Trans. Nucl Sci., NS-19(3):384-391, June 1972. 5 refs.*

The effective application of silicon (lithium) semiconductor x-ray detectors to the elemental analysis of trace impurities in environmental and biological specimens has required the improvement of existing systems. The use of low-background x-ray tubes for fluorescence excitation and the increased counting rate capability of the electronics have reduced the counting time necessary for analysis. The presence of radiation induced low energy background in conventional detectors is a major limiting factor in the detection sensitivity for trace element constituents in organic specimens. The use of guard ring detector geometries has eliminated the cause of much of the background, and has reduced the detection limits by approximately one order of magnitude. The practical detection of 0.1 ppm concentration achieved with these techniques has made energy dispersive x-ray fluorescence a potent tool for the analysis of environmental and biological samples. The following emphasize the particular advantages of this technique relative to alternative analytical methods: trace element determination in blood; air pollution particulate analysis; and studies of the influence of the environment on the trace constituents of biological specimens. In each case, x-ray fluorescence can be used to demonstrate correlations between trace element concentrations and certain biological or environmental factors. (Author summary modified)

31046 **APTIC NO. 53482**

Johnson, Lemoine L. and William P. Timmons

DUST LEAK DETECTOR FOR AIR CLEANER SYSTEMS. *(Donaldson Co., Inc., Minneapolis, Minn.) U. S. Pat. 3,696,666. 7p., Oct. 10, 1972. 7 refs. (Appl. Oct. 15, 1969, 11 claims).*

A dust leak detector for air cleaner systems is presented. The apparatus and process is described for continuously sampling, at a point downstream of the air cleaner, the normally clear air entering an engine to produce a signal indicating the cleanliness of the total air stream entering the engine. A sample of the air is continuously circulated through a small detector filter and the resistance of the filter to air flow is monitored. In case of dust leakage, the resistance of the detector filter increases very rapidly because of increased dust loading, giving an immediate indication of the abnormal condition. By using the present invention, excessive engine wear or failure caused by physical damage to the air cleaner system, can be avoided. The apparatus is simple and inexpensive to install and the detector element can be serviced at the same time the air cleaner itself is serviced. (Author abstract modified)

31047 **APTIC NO. 53457**

Kaufman, Warren F.

GAS SAMPLER. *(Philco-Ford Corp., Philadelphia, Pa.) U. S. Pat. 3,699,814. 8p., Oct. 24, 1972. 2 refs. (Appl. March 9, 1972, 10 claims).*

An apparatus for sampling gaseous exhaust emissions from vehicle engines on a constant flow basis is described. A centrifugal type extractor pump is used to draw gas through a critical flow venturi of predetermined flow rate. Exhaust emissions are diluted with air and the critical flow venturi acts as a constant volume flow device serving a metering function. Samples are taken and collected continuously during the test run, and are available to be analyzed for contaminants such as hydrocarbons, carbon monoxide, and nitrogen oxides. Deviations of only 1% inflow rate are achieved, audible noise output is reduced, and the life of the equipment is prolonged. One of the most important advantages of this system is that it can be used to sample exhaust emissions from turbine engines. (Author abstract modified)

31048 **APTIC NO. 52990**

Levy, Hiram II and Charles A. Lundquist

COMPARISON OF ATMOSPHERIC MEASUREMENT TECHNIQUES AT MT. HOPKINS OBSERVATORY. *Preprint, Washington Univ., Seattle, 11p., 1972. 12 refs. (Presented at the Use of Astronomical Techniques for the Study of Atmospheric Deterioration, Seattle, Wash., April 13, 1972.)*

The instruments available for atmospheric measurements at the Smithsonian Astrophysical Observatory s Mt. Hopkins Observatory in Arizona include: a spectral scanner for stellar-extinction measurements; sunphotometers for measurement of atmospheric turbidity; a spectral hygrometer that measures the column density of water vapor between the instruments and the sun; spectral pyranometers for measuring the radiation reaching the ground; and a pulsed ruby laser for measuring atmospheric constituents, particularly aerosols. A most useful feature of the diverse capability is the opportunity to compare results from different determinations of the same and related quantities. Comparisons of this sort were made related to turbidity, and indicate that turbidity values at a wavelength of 500 nm well below 0.01 occur at Mt. Hopkins.

31049 **APTIC NO. 52624**

Lysobey, David John

INFRARED CORRELATION SPECTROSCOPY WITH APPLICATION TO CO2 UNDER ATMOSPHERIC CONDITIONS. *Oklahoma Univ., Norman, Dept. of Physics, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 248p. 35 refs.*

The fluctuations in the infrared absorption for carbon dioxide under conditions which are typical of the lower atmosphere were investigated using infrared correlation spectroscopy. The relationship between the fluctuations in the optical variables and the thermodynamic variables were described by a Taylor series expansion of the absorption coefficient. The dependence of the fluctuating absorption coefficient on the CO2 concentration at a particular wavelength in the 4.3 micron bands was isolated to allow the determination of CO2 concentration from a single measurement of the fluctuating absorption coefficient. The atmospheric conditions were suitable for measuring the fluctuation structure of the gaseous medium by measuring the power spectral density function for the fluctuating intensity. The application of the spectroscopic technique to remote sensing of atmospheric pollution was considered. (Author abstract modified)

31050 **APTIC NO. 53101**

Maienthal, E. June

THE DETERMINATION OF IRON, TITANIUM, AND NICKEL IN APOLLO 14 SAMPLES BY CATHODE

RAY POLAROGRAPHY. J. Res. Natl. Bur. Stand. A, 76A(5):517-520, Sept./Oct. 1972. 7 refs.

Methods have been developed and applied to the determination of iron, titanium, and nickel in Apollo 14 fine soil and rock by differential cathode ray polarography on the same sample. A 5 mg sample was sufficient for the determination of all three elements Iron and titanium were determined either directly or after cupferron separation, and nickel was determined after dimethylglyoxime separation. Some preliminary work has also been undertaken to develop a polarographic method for the simultaneous determination of bismuth, copper, thallium, lead, and cadmium in lunar samples. Cathode ray polarography can also be used as an analytical method for determining constituents of metals, air particulates, waste water, and biological samples. (Author abstract modified)

31051 **APTIC NO. 53461**

Mitchell, James E.

METHOD OF DETERMINING THE CONCENTRATION OF INORGANIC SULFUR COMPOUNDS IN A GAS. *(Esso Research and Engineering Co.) U. S. Pat. 3,692,481. 3p., Sept. 19, 1972. 1 ref. (Appl. March 30, 1971, 10 claims).*

The concentration of inorganic sulfur compounds is determined by measuring the ion concentration decrease of a flame, produced by the combustion of a mixture comprising a hydrocarbon, hydrogen, and oxygen, which results from introducing said inorganic sulfur-containing compound into the flame. Preferably the inorganic sulfur compound is chosen from the group consisting of sulfur dioxide, sulfur trioxide, hydrogen sulfide, carboxysulfide, sulfur, sulfuric acid, and sulfurous acid. The ion concentration decrease is measured by a decrease in current flowing through an electrical circuit of which the flame is an integral part. Preferably, a gas chromatograph fitted with a flame ionization detector and a recorder is used to measure the concentration of inorganic sulfur compound by introducing the inorganic compound into a reference mixture, comprising hydrogen, oxygen, and hydrocarbon, and measuring the ion concentration decrease. (Author abstract modified)

31052 **APTIC NO. 53329**

Neti, Radhakrishna M. and Collin C. Bing

NITRIC OXIDE DETECTION. *(Beckman Instruments, Inc.) U. S. Pat. 3,692,485. 4p., Sept. 19, 1972. 3 refs. (Appl. July 2, 1971, 10 claims).*

A method of measuring the nitric oxide concentration in a gas stream is disclosed. The gas stream is mixed with ozone at the entrance to a reaction chamber so that the mixture enters the reaction chamber as a point source. The intensity of the emitted light as a result of the chemiluminescent reaction between the ozone and the nitric oxide at the point of source is measured. The intensity of the emitted light is a function of the nitric oxide concentration in the gas stream whereby the nitric oxide concentration is measured. Apparatus for measuring the nitric oxide concentration in a gas stream is also disclosed. The apparatus includes a walled vessel having a reaction chamber and having two inlet passages and an exhaust passage in the wall thereof. The two inlet passages converge to a common inlet opening into the chamber. A light window is positioned in the wall of the chamber opposite and in close proximity to the common inlet so that the light emitted by a chemiluminescent reaction between the gases and the two inlet passages at the common inlet can be measured as a point source. Means are associated with the light window for measuring the light emitted by the chemiluminescent reaction. (Author abstract)

31053 **APTIC NO. 53344**

O Neill, Michael E.

ON THE COLLECTION EFFICIENCY OF A SPHERICAL SAMPLER WITH SUCTION. *Chem. Eng. Sci., 27(3):519-528, March 1972. 10 refs.*

A theoretical study is made of a spherical sampler head which has an orifice through which particles can be sucked at a constant rate from a suspension of particulate material in a fluid. Account is taken of the inertia of the particles, the effect of settling under gravity, and allowance is made for the fluid to have a uniform streaming motion in the absence of the head. Assuming unseparated potential flow for the fluid motion, calculations are carried out to determine the variation of collection efficiency with Stokes number for a variety of values of the parameters characterizing the effects of settling and suction velocity. (Author abstract)

31054 **APTIC NO. 53467**

Poli, Albert A., Jr. and Sidney D. Delaune

APPARATUS FOR MEASURING CARBON MONOXIDE AND TOTAL HYDROCARBONS IN GAS SAMPLE. *(Mine Safety Appliances Company, Pittsburgh, Pa.) U. S. Pat. 3,692,492. 3p., Sept. 19, 1972. 3 refs. (Appl. Feb. 8, 1971, 10 claims).*

An apparatus for simultaneously measuring the amounts of carbon monoxide and total hydrocarbons in a gas sample is presented. The device is comprised of two hydrogen flame burners, a conduit for delivering part of the sample to the first burner, and a second conduit for simultaneously delivering the rest of the sample to the second burner. A reactor in the second conduit converts carbon monoxide to methane. The portion of the sample delivered by the second conduit will contain a greater amount of hydrocarbons than the part delivered by the first conduit. (Author abstract modified)

31055 **APTIC NO. 53466**

Purt, Gustav, Walter Bosshard, and Gerhard Meier

APPARATUS FOR CHECKING OPERATION OF SMOKE DETECTORS. *(Cerberus A. G., Mannedorf (Switzerland)) U. S. Pat. 3,693,401. 5p., Sept. 26, 1972. 3 refs. (Appl. Nov. 13, 1970, 13 claims).*

A device for testing the operation of smoke detectors is presented. The unit is comprised of a housing member adapted to be placed over a smoke detector device whose internal volume will be less than one-half that of the housing, a container holding a non-poisonous carrier medium liquefied under pressure and having a boiling point in the range of minus 20 C to plus 20 C, and a spray valve whose nozzle leads into the housing interior to deliver the liquid test medium as a spray. The device is arranged so that only a small quantity of the test substance is necessary for one test; hence, after the test the smoke detector immediately returns to an operational condition. Particularly suitable carrier mediums are fully halogenated hydrocarbons with suitable boiling points. (Author summary modified)

31056 **APTIC NO. 53462**

Robrecht, Charles J. and John S. Wyman, Jr.

DISPOSABLE AIR SAMPLING FILTER CASSETTE. *(Bendix Corp.) U. S. Pat 3,693,410. 7p., Sept. 26, 1972. 6 refs. (Appl Feb. 2, 1970, 7 claims)*

A composite filter unit and cassette to serve as an air sampler for personal use in connection with a metering pump and a cyclone unit is presented. The filter unit is formed of two opposed shells with interfitting flanges to provide a support for the circumferential edges of a filter disc and to form chambers on each side of the disc, one to serve as an inlet and one to serve as an outlet. The chambers are provided with tangential openings so that inlet air is directed parallel to the disc in a toroidal path where it can flow uniformly through the filter disc to the opposed chamber and outlet. The composite filter unit is encapsulated in a cassette during use to protect it against outside contamination, the encapsulator having a special configuration for cooperation with a garment support bracket. (Author abstract)

31057 APTIC NO. 52587

Russell, James M., III and S. Roland Drayson

THE INFERENCE OF ATMOSPHERIC OZONE USING SATELLITE HORIZON MEASUREMENTS IN THE 1042 CM(-1) BAND. *J. Atmospheric Sci., 29(2):376-390, March 1972. 40 refs.*

A method for inferring atmospheric ozone data using infrared horizon radiance measurements in the 1042/cm band was studied. The feasibility of the method was determined, and ozone partial pressure was determined in the altitude range of 25-50 km. The effects of individual and simultaneous error sources was investigated. In the absence of a temperature profile bias error, the ozone partial pressure could be determined to within an rms value of 15-20%. (Author abstract modified)

31058 APTIC NO. 53038

Saxena, V. K., D. J. Alofs, A. C. Tebelak, and P. A. Allee

A COMPARATIVE STUDY OF AITKEN NUCLEI COUNTERS. *J. Rech. Atmospheriques, 6(1-3):495-505, Jan.-Sept. 1972. 33 refs.*

An intercomparison was made between the readings of different Aitken nuclei counters sampling the same aerosol over a wide range of concentration. The counters were three Gardner counters, one General Electric (G.E.) counter, one Environment-One (E-One) counter, and an absolute counter developed at the University of Missouri-Rolla (UMRAC). Atmospheric air, sodium chloride and silver iodide aerosols were used for this intercomparison. In general, the concentration measured by other counters was lower than that given by UMRAC for the same aerosol sample. However, the maximum deviations were within one order of magnitude and were recorded for AgI aerosol. These deviations depend on both the concentration and composition of the test aerosol, but no definite trend could be established with respect to either of them. A plausible explanation for these low counts is suggested in terms of diffusion losses of aerosol particles and the supersaturation decrement with the counter. The maximum deviation between three Gardner counters was 100%, and between G.E. and E-One counter was 35%. A Pollak counter was also operated during a limited period of time using AgI and AgI-NaI-Acetone aerosols. The counts recorded by the Pollak counter were consistently lower than those recorded by UMRAC, and the extreme deviation reached to two orders of magnitude. These unexpectedly large deviations indicate that for aerosols containing high concentration of finer particles, the loss of particles due to coagulation and diffusion into the walls of the Pollak counter during waiting interval was significant. The conclusions are based on the assumptions that the sample was uniform and the sampling errors were negligible. (Author abstract)

31059 APTIC NO. 53516

Smith, Avery B., Ralph R. Hennig, Abraham J. Kurtz, and Gregory Pantchenko

COLORIMETRIC INDICATOR SOLUTION FOR THE DETECTION OF NITROGEN DIOXIDE AND METHOD OF ANALYSIS. *(Resource Control, Inc.) U. S. Pat. 3,704,098. 3p., Nov. 28, 1972. 4 refs. (Appl. June 22, 1970, 6 claims).*

Soluble tablets suitable for providing a colorimetric indicator solution for quantitatively measuring the nitrogen dioxide contamination in an atmosphere are described. The indicator solution, which has a pH of not more than 4.0, is prepared by dissolving a tablet containing a diazotizing agent mechanically supported in a suitable manner and a second tablet containing a coupling agent also mechanically supported in a suitable manner in a predetermined amount of water. A measured solution is transferred to an absorption bubbler of the type customarily used in colorimetric analysis. The reagent solution is exposed to metered quantities of air containing NO2 as a contaminant, resulting in the formation of red violet diazo dye. The NO2 content is readily measured by examining the sample exposed in a colorimeter. This method eliminates the drawbacks to the Saltzman reaction by eliminating the elaborate glass equipment and by providing a convenient and accurate way to prepare the Saltzman reagent. (Author abstract modified)

31060 APTIC NO. 53286

Spurny, K. R. and J. P. Lodge, Jr.

COMMENTS ON THE ANALYSIS OF AEROSOLS IN THE LOWER STRATOSPHERE. *(Remarque sur l analyse des aerosols dans la basse stratosphere). Text in French. J. Rech. Atmospheriques, 6(1-3):559-563, Jan.-Sept. 1972. 11 refs.*

The determination of aerosol properties in the lower stratosphere by means of pore filters is described. Nuclepore filters, especially golden membrane filters, are praticularly suitable for such determinations; they are transparent and have a smooth surface, properties which are advantageous for examination by either the optical or electron microscope. Since these filters are soluble only in chloroform, they can be used in microchemical analysis of aerosols, analysis of activation, and for measurement of glycogenic nuclei. In order to apply these filters to a diffusion microbattery it is necessary to know their pore size, the filter thickness, porosity of the filter, and the velocity of the air passing through the filter. For the analysis of mixed aerosols, the size of the particles of the components may be measured by measuring their penetration into the filter. Sampling and calculation of the total concentration of aerosol are described.

31061 APTIC NO. 53012

Streiff, M. L. and C. L. Claysmith

DESIGN AND CONSTRUCTION OF A SYSTEM FOR REMOTE OPTICAL SENSING OF EMISSIONS. *General Dynamics, San Diego, Calif., Convair Aerospace Division, Office of Research and Monitoring Contract CPA-22-69-142, R2-72-052, Program Element 1A1010, 443p., Oct. 1972.*

NTIS: PB 221073

An overall and detailed instrument design and initial acceptance performance tests of a system for remote optical sensing of emissions is presented. The instrument may be used to measure transmission of urban atmospheres, using a remote source (up to 4 km) or to measure emission from sources such as smokestacks. It is designed to measure the absorption or emission caused by pollution by scanning spectrally in the 3.0-5.5 micron and 7.0-13.5 micron regions. Data may be recorded on a strip chart recorder, a digital printer, and/or a magnetic tape recorder. Digital and analog displays or wavenumber and signal output (either source or reference) and the ratio (transmission) of the source to reference signals are provided. The system is designed to be easily transported for filed use. A summary of specifications is given. A discussion of the system design, a description of component details, set-up procedures and operation, system performance in the laboratory and the results of initial field tests, maintenance recommendations, wiring tables, and reduced size drawings are presented.

31062 APTIC NO. 53348

Vaneldik, Jan Frederick, Ronald Ian Wilson, Gerrit Richard Kampjes, and William James Lavender

ELECTROSTATIC PRECIPITATOR AND GAS SAMPLING SYSTEM. *(Sherritt Gordon Mines, Ltd., Toronto (Canada)) U. S. Pat. 3,705,478. 8p., Dec. 12, 1972. 20 refs. (Appl. Aug. 4, 1970, 1 claim).*

An electrostatic precipitator especially suited for use in a gas sampling system for removing solid particulate material from a sample gas stream withdrawn from an ore reduction roaster for passage to a gas chromatography unit was designed to remove residual and very small particulate material from such a gas stream after passage through a relatively coarse screen filter. The electrostatic precipitator includes a housing divided by a downwardly extending partition into an ionization chamber containing an ionizing electrode and a collector chamber containing a plate-type collector electrode. The partition terminates upwardly of the floor of the housing to provide a dust-collection chamber through which the gas stream flows on passing from the ionization chamber to the collector chamber. In the overall gas sampling system, a blow-back gas system is provided for dislodging solid material from screen filter and from the upstream portion of the sampling conduit and for returning dislodged material to the roaster to prevent cumulative plugging of the system. Operation of such a blow-back system is usefully controlled by a sampling programmer of the gas chromatography unit to which the system is coupled so that such blow-back system operates automatically between successive analyses. (Author abstract)

31063 **APTIC NO. 53332**

Wallace, Thomas P. and Wayne B. Scott

SIZE DISTRIBUTION ANALYSIS OF POLYMER LATEX SYSTEMS BY USE OF THE EXTREMA IN THE ANGULAR LIGHT SCATTERING PATTERN. III. UNPOLARIZED AND HORIZONTALLY POLARIZED SCATTERED LIGHT. *J. Polymer Sci., Part A-2, vol. 10:527-539, March 1972. 18 refs.*

The extrema in the unpolarized and the horizontally polarized angular scattering patterns are used as a basis for size distribution analysis of polymer latex systems composed of single, spherical, optically isotropic particles. The method of analysis is similar to that recently proposed for vertically polarized scattered light and the polarization ratio, where the modal diameter and a distribution width parameter are determined from the experimental angular scattering pattern and prepared theoretical diagrams obtained by Mie theory calculations. The method of analysis, based on all four scattering functions, is illustrated by use of a Dow polystyrene latex sample. (Author abstract

1971

31064 **APTIC NO. 52992**

VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany), Kommission Reinhaltung der Luft

INSTRUCTION FOR EMISSION MEASUREMENTS FOR WASTE INCINERATORS WITH THROUGHPUT CAPACITIES UP TO 1500 KG/HR. *(Anleitung fuer Emissionsmessungen an Abfallverbrennungsanlagen mit Durchsatzleistungen bis zu 1500 kg/h). Text in German. VDI (Ver. Deut. Ingr.) Richtlinien, no. 2301:1-2, Sept. 1971.*

Instructions for emission measurements of waste incinerators with throughput capacities of up to 1500 kg/hr are presented. Emission measurements should be performed during normal operation. Odor tests, as well as carbon monoxide, sulfur dioxide, hydrochloric acid, and hydrofluoric acid concentration measurements should be conducted in the gas duct. At least six measurements of a duration of 10 min, spread over 2 hr, are necessary for continuously charged incinerators. The dust content is determined by measuring a filter inserted in a partial flow, and by ignoring precipitated acid compounds. The waste gas temperature and composition should be continuously recorded. The waste gas plume is evaluated against the Ringelmann gray wedge. Bacharach soot indices should be determined at a point before the inlet of cooling air.

31065 **APTIC NO. 52567**

Ash, Robert M. and Jeremiah R. Lynch

THE EVALUATION OF GAS DETECTOR TUBE SYSTEMS: CARBON TETRACHLORIDE. *Am. Ind. Hyg. Assoc. J., 32(8):552-553, Aug. 1971. 1 ref.*

Chemical indicator tubes provide a rapid, inexpensive, and simple method for evaluating gaseous contaminant levels, but their reliability is questionable. Tests on tubes with ranges including 10-50 ppm were carried out using carbon tetrachloride. The CCl_4 was generated by means of a double-dilution, vapor-pressure system, and concentration levels were confirmed by gas chromatography. None of the tubes were satisfactory, even at an accuracy of within 50% of the stated concentration.

31066 **APTIC NO. 52989**

Engdahl, Richard B.

MEASUREMENT OF FINE PARTICLES SUSPENDED IN EXHAUST GASES. *Chemical Inst. of Canada, Ottawa (Ontario), Source Sampling Atmos. Contam. Symp. Proc., Toronto, Ontario, 1971, 17p. 12 refs. (Feb. 23.)*

To obtain representative samples for the measurement of fine particles suspended in exhaust gases, segregation of particles must be avoided and the boiler firing rate must be known. Angular flow effects can be avoided by sampling after spin has dissipated. Samples must be captured with minimum flow disturbance, necessitating the use of a sharp-edged sampling nozzle and isokinetic sampling. Some sampling techniques and problems are presented.

31067 **APTIC NO. 52548**

Kildal, Helge and Robert L. Byer

COMPARISON OF LASER METHODS FOR THE REMOTE DETECTION OF ATMOSPHERIC POLLUTANTS. *Proc. IEEE (Inst. Elec. Electron. Engrs.), 59(12):1644-1663, Dec. 1971. 58 refs.*

Three methods of remote air pollution detection -- Raman backscattering, resonance backscattering, and resonance absorption -- are discussed and compared. Theoretical expressions are derived for the minimum detectable pollutant concentration, and in each case the depth resolution and the problems of interference, pump depletion, and background noise are discussed. A brief discussion of possible laser sources is included, numerical examples of the detectabilities based on present technology are given. The atmospheric transparency limited the useful range to a few km for the Raman and resonance backscattering schemes. For the resonance absorption technique the useful range can be as great as 50 km. (Author abstract)

31068 **APTIC NO. 52649**

Kildal, H. and R. L. Byer

COMPARISON OF LASER METHODS FOR THE REMOTE DETECTION OF ATMOSPHERIC POLLUTANTS. *Stanford Univ., Calif., Microwave Lab., National Aeronautics and Space Administration Grant NGL-05-020-103, Office of Naval Research Contract N00014(67-A-0112)0044, 98p., 1971. 58 refs.*

NTIS: AD 730770

Three methods of remote air pollution detection were studied and compared with respect to theoretical basis of operation, operating variables, minimum detectable pollutant concentration, depth resolution, interference, pump depletion, background noise, and possible laser sources. The application of Raman backscattering, resonance backscattering, and resonance absorption to the remote sensing of sulfur dioxide, nitrogen dioxide, carbon monoxide, metal compounds (mercury and sodium), and hydrocarbons, (benzene) was reviewed. The range of detectability was only a few kilometers for the Raman and resonance backscattering techniques and was limited by atmospheric transparency; for the resonance absorption technique, the useful range could be as great at 50 km. (Author abstract modified)

31069 **APTIC NO. 52528**

Nenadic, C. M. and J. V. Crable

APPLICATION OF X-RAY DIFFRACTION TO ANALYTICAL PROBLEMS OF OCCUPATIONAL HEALTH. *Am. Ind. Hyg. Assoc. J., 32(8):529-538, Aug. 1971. 36 refs.*

Automatic X-ray diffraction is the most widely used instrumental technique for identifying and quantifying inorganic, crystalline compounds that have been implicated as causative agents in silicosis, pneumoconiosis, and other related occupational lung diseases. Three facts of the diffraction procedure are reviewed: preparation of bulk, rafter, airborne dust, and biological samples; qualitative analysis; and quantitative analysis. The identification of inorganic compounds and minerals is accomplished in the majority of cases by comparison of the powder diffraction pattern of an unknown with the diffraction patterns on file in the American Society for Testing and Materials indexing system. Quantitative analysis is accomplished by the direct comparison method or the internal standard method. The direct comparison method requires less sample preparation but may require more data manipulation to achieve the accuracy desired. The internal method is preferred by most investigators. It has been applied to quartz, cristobalite, crocidolite, amosite, tridymite, kaolinite, illite, and muscovite.

31070 **APTIC NO. 53422**

O Connor, D. T.

CALIBRATION OF A CASCADE CENTRIPETER DUST SAMPLER. *Atomic Energy Authority, Harwell (England), Radiological Protection Div., AHSB(RP) R 108, 24p., Feb. 1971. 8 refs.*

The performance of a size selective air sampler, the cascade centripeter, for use as an instrument for sizing solid airborne particles was investigated using unit density spheres of methylene blue and denser non-spherical particles of silicon carbide and uranium oxide. The instrument can be used to determine the particle size distribution of airborne particles, irregular in shape, over a wide range of density. Effective cut-off sizes are recommended as characteristic for the respective collection stages. (Author abstract)

31071 **APTIC NO. 52549**

Osborne, Brian F.

A PRACTICAL ON-STREAM PARTICLE SIZE ANALYSIS SYSTEM. *ISA (Instr. Soc. Am.) Trans., 10(4):379-385, 1971. 3 refs.*

A practical on-stream particle size analysis system is described. The system is divided into four sections: the sampling system, the stream measuring system, electronic data handling, and subsequent control techniques. A new, on-stream particle size analyzer based on a separation principle and radiation detector and the means to supply the instrument with a suitable feed stream are reviewed. The operating principle of the analyzer, which has a wide particle size range is also discussed. Typical results obtained on slurries are presented, and their accuracies were assessed according to the precision required for control techniques. The electronic data handling system is described, with an explanation of how data are processed electronically to obtain a signal proportonal to particle size and suitable for control purposes. Signals for process control are reviewed. (Author abstract modified)

31072 **APTIC NO. 53079**

Paukovic, Ranka and Mirka Fugas

APPLICATION OF PERSONAL SAMPLERS IN THE ASSESSMENT OF WORKERS EXPOSURE TO NOXIOUS SUBSTANCES IN AIR. *(Primjena osobnih sakupljaca uzoraka za ocjenu ekspozicije radnika stetnim tvarima uzraku). Text in Croatian. Arhiv. Hig. Rada, 22(2):143-149, 1971. 4 refs.*

The essential conditions for efficient collection of representative air samples are discussed. The advantage of personal air samplers for assessing occupational exposure is pointed out. The determination of lead in air in parallel samples collected by identical personal and stationary samplers showed the questionable value of stationary samplers. To enable a wider application of personal samplers, it is necessary to revise the threshold limit values on the basis of the relation between exposure levels as measured with personal samplers and biological effects. (Author summary modified)

31073 **APTIC NO. 53199**

Robertson, Louis A.

CHEMICAL AGENT DETECTOR HOLDER AND METHOD OF TESTING AIR AND LIQUIDS FOR CHEMICAL AGENT CONTAMINATION. *(Dept. of the Army, Washington, D. C.) U. S. Pat. 3,628, 915. 4p., Dec. 21, 1971. 5 refs. (Appl. July 3, 1969, 6 claims).*

An apparatus and method for detecting any chemical agent contamination within an air or water sample are described. The apparatus comprises a detector located between a pair of block members with each block member adapted to move in respect to each other by means of arm members attached to each block member. One block member is held within the other by a spring located between the arm members, and a means is provided to draw an air sample through the apparatus. This invention solves the problem of obtaining a compact and economical method of testing polluted air and water, particularly while wearing protective gloves. (Author abstract modified)

31074 **APTIC NO. 52576**

Saenz, Oscar, Jr., Clarence A. Boldt, Jr., and David S. Tarazi

MEASUREMENT OF NON-METHANE HYDROCARBONS. *Southwest Research Inst., Houston, Texas, Air Pollution Control Office Contract CPA 70-40, SWRI Proj. 21-2811, Rept. APTD-0905, 33p., June 1971. 4 refs.*

NTIS: PB 205893

The operating variables involved in the measurement of non-methane hydrocarbons using a flame ionization detector were studied. Total hydrocarbons were measured by running air directly through the detector; methane was measured by running air through a methane-saturated carbon column. The difference in results was used to determine the concentration of the non-methane hydrocarbons. The design, operation, calibration procedure, ambient sampling results, and calculations were reviewed. (Author summary modified)

31075 **APTIC NO. 52540**

Syvertsen, Glenn V.

SUB-MICRON PARTICLE CLASSIFICATION NOW POSSIBLE. *Mater. Eng., 74(7):66-67, Dec. 1971.*

A technique for the classification of sub-micron particles was developed and tested. The classifier produces a vortical airflow, and powder material is fed into the vortex pneumatically at a controlled rate. The rotor provides high dispersion to achieve sharp cuts over a wide particle size spectrum. The cut size range extends within 0.5-50 micron. The design and operation of the classifier are reviewed.

1970

31076 **APTIC NO. 52980**

Barringer, A. R., J. H. Davies, and A. J. Moffat

THE PROBLEMS AND POTENTIAL IN MONITORING POLLUTION FROM SATELLITES. *Preprint, American Inst. of Aeronautics and Astronautics, New York, Techni-*

cal Information Service, 16p., 1970. 8 refs. (Presented at the American Institute of Aeronautics and Astronautics, Earth Resources Observations and Information Systems Meeting, Annapolis, Md., March 2-4, 1970, Paper 70-305.)

The problems and potential in monitoring pollution from satellites are reviewed. Observations of particulate pollution have been made from Nimbus type satellites and smoke plumes have been observed and traced on Gemini photography. The remote sensing of gaseous pollutants by identification of the spectral characteristics of reflected sunlight are feasible from high aircraft altitudes. The problems connected with scattering effects in the atmosphere and the techniques under study for quantitatively measuring this effect are discussed. The problem is particularly severe in the case of sulfur dioxide when measured in the ultraviolet, due to the attenuation of ultraviolet light by the ozonosphere. Difficulties are decreased in the visible spectrum when measuring nitrogen dioxide and the halogens and become even less of a problem in the near infrared. Stratospheric balloon tests and optical correlation techniques which are being studied for application in the remote sensing of pollutant gases are reviewed. The potential in monitoring pollution is considered, including: monitoring the spread of pollution under various meteorological conditions; relating pollution distribution to vegetation damage and correlation to health statistics; the mechanism of dispersion of pollution over unpopulated areas, forests, and oceans; and delineation of air sheds and tracing plumes from individual sources. (Author abstract modified)

31077 **APTIC NO. 53102**

Helbig, H. and Ch. Werner

MEASUREMENTS OF VERTICAL AEROSOL DISTRIBUTION IN THE ATMOSPHERE WITH A LIDAR-SYSTEM DURING THE ATLANTIC TRADE WIND EXPERIMENT (ATEX) ON BOARD THE W.F.S. PLANET. I. TECHNICS. *(Ein Lidar- System zur Messung der vertikalen Dunstverteilung in der Atmosphaere waehrend des Atlantischen Passat Experiments (APEX) auf W.F.S. Plantet. I. Technischer Teil). Text in German. Meteor Forschungsergeb., Reihe B, no. 5:52-61, Dec. 1970. 12 refs.*

The construction characteristics and the technical data of a lidar-system are described. This system, which measures vertical aerosol distribution in the atmosphere, was placed in operation on board the W.F.S. Planet during the Atlantic Trade Wind Experiment. The laser transmitter is a ruby giant pulse laser with a chemical Q-switch which transmits short light pulses of high power vertically into the atmosphere. The light, which is scattered in the atmosphere, is collected by the receiver via a telescopic mirror. The receiver is placed adjacent to the transmitter. The special problems encountered in the construction of the lidar-system for shipboard operation are described, along with the difficulties involved in the operation of the equipment on board ship, especially in tropical regions. (Author summary modified)

31078 **APTIC NO. 52537**

Schierjott, Guenter

RAPID, QUANTITATIVE ELECTROCHEMICAL ANALYSIS OF LIQUID AND GASEOUS MEDIA. *(Verfahren und Vorrichtung zur elektrochemischen Analyse fluessiger und gasfoermiger Medien). Text in German. (Assignee not given.) W. Ger. Pat. Appl. 2,056,188. 10p., Nov. 16, 1970. 8 refs. (7 claims).*

A flow-through cell is described for determining electrochemically active species in water or gas streams. The potential difference between the reagent steam containing a redox couple for ferrous ammonium sulfate-ferric ammonium sulfate and a steam of the reaction mixture of the sample, and reagent is measured directly. Redox and ion-selective electrodes are placed in the two streams and potassium dichromate in water streams and chlorine in a gas streams can be determined. (Author abstract modified)

31079 **APTIC NO. 52583**

Stevens, Robert K.

THE AUTOMATED GAS CHROMATOGRAPH AS AN AIR POLLUTANT MONITOR. *Air Force Systems Command, Wright Patterson AFB, Ohio, Aerospace Medical Research Lab. Contract F33615-70-C-1046, Proj. 6302, AMRL-TR-70-102, 10p., Dec. 1970. 7 refs. (Presented at the Environmental Toxicology Conference, Annual, 1st, Fairborn, Ohio, Sept. 9-11, 1970, Paper 17.)*

NTIS, DDC: AD 727521

The application of an automated gas chromatograph to routine monitoring of ambient and source concentrations of carbon monoxide, methane, sulfur dioxide, and hydrogen sulfide was studied. The system design and operation, sampling methods, and analytical techniques are examined.

1969

31080 **APTIC NO. 52969**

Iinoya, Koichi and Zennosuke Tanaka

PARTICLE SIZE CLASSIFICATION BY DEPOSITION ANGLE IN A REDUCED PRESSURE CENTRIFUGE. *U. S.-Japan Particulate Technol. Semin., Kyoto (Japan), 1969, p. 226-232. 5 refs. (Oct. 6-11, Paper 8-7.)*

The validity of classifying particle size according to deposition angle within a reduced pressure centrifuge was studied at various pressures using glass beads, zinc powder, and monodispersed latex as the particles. Particle size classification in the submicron range was shown to be possible both theoretically and experimentally through the method proposed. However, while the experimental results agree well with the theoretical ones at normal pressure, under reduced pressure, the former deviates more or less from the latter. It is not known whether the deviation is caused by the effect of initial velocity, the accuracy of the Cunningham correction as applied to the equations of motion, or Basset s term. In the future, the effect of correction and the integral term should be scrutinized.

31081 **APTIC NO. 52970**

Iinoya, Koichi and Kinnosuke Watanabe

A NEW TYPE OF POWDER FLOW METER (IMPACT-LINE FLOWMETER). *U. S.- Japan Particulate Technol. Semin., Kyoto (Japan), 1969, p. 336- 339. 2 refs. (Oct. 6-11, Paper 9-10.)*

A new type of powder flowmeter, the impact-line flowmeter, is described. It offers advantages over the hopper scale and conveyor scale flowmeters in that it is economical, compact, suitable for on-line automation, and has no zero drift. As the powder material falls from the feeder onto the sensing plate of the impact-line flowmeter, an impact is created which is proportional to the instantaneous flow rate of the powder material; the horizontal component of the impact is used as the basis for measuring. The meter can measure the flow rate of materials varying in size from fine powders to lumps the size of a football; with appropriate sensing plate adjustments, it can safely and effectively measure the flow rates of materials of extreme temperature or caustic nature. It can be hooked up with any industrial meter and can be completely enclosed to obviate any dust problems.

31082 **APTIC NO. 52965**

Jimbo, Genji, Masao Yamazaki, Sadao Asakawa, Satoshi Fujita, and Yasumichi Ishii

A PROPOSAL OF THE MEASURING METHOD OF PARTICLE SIZE AND SHAPE BY PHOTOSCANNING IMAGE ANALYSING. *U. S.-Japan Particulate Technol. Semin., Kyoto (Japan), 1969, p. 28-33. (Oct. 6-11, Paper 6-3.)*

Ways of improving the projected image analyzing method of fine particle size measurement are discussed. Although the method is essentially advantageous (e.g., it is direct and can measure any type of material over a wide range of particle sizes), it can be improved by increasing the measuring speed without increasing human labor and by taking advantage of the variety of information provided by the projected image. Methods of image counting and particle sizing include those which are manual, semi-automatic, and fully automatic; the latter can be divided into slit-scanning, spot-scanning, and multi-spot or image disintegrating methods. The multi-spot methods offer the greatest potential, but are costly and do not yield a sufficient variety of information about the particles. To overcome these disadvantages, the following processes must be improved separately then combined into a single system of multi-spot analysis: projection and fixation of the particle images; transformation of the images into signals representing various types of information; and computation and representation of this information. The first process has been achieved using microscopic photographing, with mechanical zig-zag movement of a light spot being used as a scanning method. The strength of the light as it passes through film which intersects the images of the particles is converted into pulses, which are then classified into two groups and punched directly on computer tape. In this way, the images of the particles are changed into a matrix of numbers. This method allows the accurate estimation of three dimensional size and the automatic obtainment of the shape factors of the particles. The method is still costly and the measuring speed is low; both the computer programming and mechanical scanning methods must be altered to overcome these disadvantages.

31083 **APTIC NO. 53019**

Joszko, H.

DETERMINATION OF LOW CONCENTRATIONS OF PHENOL AND CRESOL IN THE AIR. PART II. *(Oznaczanie niskich stezen fenolu i krezolu w powietrze. Czesc II). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 3(3):9-18, 1969. 3 refs.*

NTIS: TT 70-55123/3

A spectrophotometric method of determining phenol and cresol was developed for concentration ranges of 0.02-0.08 and 0.02-0.1 mg/50 ml, respectively. Direct determination of these compounds in their mixture is impossible in view of too close a position of the corresponding absorbance maxima. The values of absorbance for increasing concentration of phenol, m-cresol, and their mixtures are given to obtain the absorbance curves for individual components and the points corresponding to a mixture of phenol with m-cresol. (Author abstract modified)

31084 **APTIC NO. 52967**

Kanagawa, Akira

SIDEWAYS LIGHT SCATTERING PARTICLE COUNTER. *U. S.-Japan Particulate Technol. Semin., Kyoto (Japan), 1969, p. 52-55. 2 refs. (Oct. 6-11, Paper 6-6.)*

The optimum geometries for light scattering aerosol particle counters employing sideways angle scattering are discussed. The response curves of the sideways scattering particle counter were calculated for spherical transparent particles using various optical lens geometries. The calculations were made using Mie theory and Gucker Hodkinson equations. According to these calculations, reducing the inclination of the axis of the illumination and collection lenses without enlargement of the lens apertures increases the sensitivity of the counter. Thus a counter with an inclination of 60 deg is recommended over a counter with an inclination of 90 deg for use with transparent particles.

31085 **APTIC NO. 53530**

Orr, Clyde, Jr.

AUTOMATIC PARTICLE SIZE ANALYSIS IN THE SUB-SIEVE RANGE. *U. S.- Japan Particulate Technol. Semin. Kyoto, Japan, 1969. p. 1-21. 7 refs. (Oct. 6-11, Paper 6-1.)*

The Model 5000 Particle Size Analyzer measures the sedimentation rates of particles in suspension and automatically presents these data as a cumulative percent distribution in terms of the Stokesian equivalent spherical diameter. A particle size distribution between 50 and 0.2 micron can be obtained with most materials, with a greater range being possible depending on the density of the material. Direct recording of the size distributions of solids having different densities is possible. The time required for analysis is inversely proportional to the particle density and to the minimum size desired. The instrument s basic construction is described, as is its theoretical background. With regard to accuracy, potential error is introduced by the following sources: influence of the wall of the container (0.1% error); influence of particle acceleration (insignificant error); influence of heat input by measuring system (negligible error); particle-to-particle interaction (less than 1% error); discontinuity of the fluid (of no concern in liquid sedimentation); Brownian motion and diffusion (significant only for essentially monodisperse powders less than 0.5 micron in diameter), and electronic and mechanical factors (less than +0.5% error). The analyzer uses x-rays to measure the sedimentation.

31086 **APTIC NO. 53146**

Ryszka, E.

CONVENTIONAL EQUIPMENT FOR INTERMITTENT MEASUREMENTS OF DUST CONCENTRATION IN GASES IN DUCTS. *(Typowa aparatura do okresowych pomiarow stezenia zapylenia gazu w przewodach). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 3(3):19-30, 1969. 6 refs.*

NTIS: TT 70-55123/3

Conventional equipment for intermittent nonautomatic measurements of dust concentration in waste gases and fumes in industrial ducts is reviewed. The design and application range of individual apparatus components are discussed. Apparatuses for dust-laden gas sampling, for the measurements of temperature and pressures of the dust-laden gas in the duct, for the determination of the chemical composition of the gas, and for the determination of humidity of the gas are described. These include samplers and sampling probes.

31087 **APTIC NO. 52966**

Tanaka, Tatsuo and Yoji Nakajima

CONTINUOUS ON-LINE PARTICLE-SIZE ANALYZER. *U. S.-Japan Particulate Technol. Semin., Kyoto (Japan), 1969, p. 22-27. (Oct. 6-11, Papers 6-2.)*

A new instrument for the on-line measurement of average particle sizes is discussed, along with its potential application to powder handling processes. Solid flow from a process line is fed into an elutriation tube in which the flow rate is kept constant. The stream of particles is completely separated in the tube, and the flow rate of tailing is compared with that of the fine. The flow rate ratio becomes unity so that the average velocity of air in the elutriator is equal to the terminal velocity of the particles. Thus the measurement of air velocity makes possible the determination of the average sizes of the particles. The instrument was tested using five fractions of silica sand and glass spheres ranging in size from 0.1 to 0.5 mm. The results obtained agreed fairly well with those obtained by sieving, especially for the glass spheres. The settling time was about 10 sec, with a quicker response being obtainable via shortening of the elutriator's length.

31088 **APTIC NO. 52968**

Yuu, Shinichi and Koichi Iinoya

A NEW WEIGHING TYPE CASCADE IMPACTOR. *U.S.-Japan Particulate Technol. Semin., Kyoto (Japan), 1969, p. 56-63. 5 refs. (Oct. 6-11, Paper 6-7.)*

A new weighing type of cascade impactor which has been developed to measure particle size distribution and dust concentration is described. The new impactor appears in two-dimensional and round nozzle (three-dimensional) varieties; the classification performances of the two are equal, although the former is more accurate. The separation mechanism of the two-dimensional impactor can be adequately approximated by the use of a stream line model, while Strand s velocity potential can be used to approximate the separation performance of the round nozzle impactor. A gravitational term can be introduced into the equation of particle motion to represent the separation mechanism of a cascade impactor affected by particle gravity. With the cascade impactor the particle size can be practically used as the cut size in order to measure the particle size distribution of industrial dust in general; the particle size distribution of flue dust can be directly measured; the reentrainment limit of the collected weight on each stage is obtained; and the particle size distribution of a monodisperse aerosol can also be measured.

1967

31089 **APTIC NO. 52981**

Dubois, E., P. Magot-Cuvru, J. Y. Deysson, M. Lutz, H. Metivier, and R. Bessieres

EXPERIMENTAL STUDY OF AN AEROSOL SIZE SELECTOR. *(Etude Experimentale d un selecteur de tailles pour aerosols). Text in French. Assessment Airborne Radioactiv. Proc. Symp., Vienna, Austria, 1967, p. 379-392. 2 refs. (July 3-7.)*

An aerosol size selector is described. Particles are separated according to size through the inertia effect. The biggest particles are concentrated at the center of the gas stream from a circular orifice and collected by a sampling probe placed immediately after the opening along with the co-axial. The gas flow through the probe represents a small fraction of the total flow, while the particle flow can be a very large fraction of the total particle flow entering the apparatus. The air passes in succession through a number of openings of decreasing size. At each stage, the largest particle fraction is diverted into the probe while the fine fraction is diverted to the next stage. This apparatus can be used for separating particles according to size while maintaining the aerosol state. By carefully dimensioning and grouping the different stages it is possible, with a given polydispersed aerosol, to isolate the large-particle fraction, the fine fraction, or the intermediate fraction.

31090 **APTIC NO. 52995**

Raabe, O. G.

CALIBRATION AND USE OF THE GOETZ AEROSOL SPECTROMETER. *Assessment Airborne Radioactiv., Proc. Symp., Vienna, Austria, 1967, p. 417-431. 17 refs. (July 3-7.)*

Calibration and use of the Goetz aerosol spectrometer is described. The aerosol spectrometer is an aerodynamic size selective sampler which collects a sample of an aerosol passing through flow channels using high centrifugal forces. The aerosol particles are deposited upon a paper or coil collection liner. The practical aspects of the employment of the aerosol spectrometer to determine the aerodynamic equivalent size distribution of radioactive aerosols in the sub-micron range are discussed. The physical characteristics of the machine, the factors affecting its operation, and both the theoretically predicted and empirical character of the deposit are reviewed. A special paper pattern to be used as the collection liner was designed to facilitate the location of deposition positions and the systematic choice of sections of the deposit to be used for the analysis of samples is described. A detailed experimental calibration involving electron micrographs showing the deposit of polydisperse test aerosols of polystyrene spheres at various positions in the channels was conducted and is discussed. The results obtained were in agreement with the theoretically predicted cut-off sizes at the various positions indicating that such detailed calibration experiments are not routinely necessary. The concentrations of particles of various sizes observed on the electron micrographs were used in conjunction with theoretical predictions to develop a numerical procedure for the analysis of samples of unknown aerosols. This analysis divides the radioactivity distribution with respect to aerodynamic equivalent size into 13 size groups upon the gross quantities of the radioisotope of interest which are found upon selected small sections of the deposit pattern. This procedure is a type of deposit stripping which avoids the theoretical errors associated with the designed analysis method, and to which samples of radioactive aerosols are particularly suited. (Author abstract)

1964

31091 **APTIC NO. 53136**

Fernandez, Gonzalo

PARTICLE SIZE DETERMINATION BY USE OF ELECTROSTATIC PRECIPITATION PATTERNS AND RADIOACTIVE TRACERS. *Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio, School of Engineering, Thesis (M.S.), 1964, 95p. 11 refs. (Presented at the American Nuclear Society Winter Meeting, San Francisco, Calif., Nov. 30- Dec. 3, 1964.)*

NTIS: Conf 65470

The validity limits of a previously derived theoretical model of an electrostatic precipitator air sampler were determined. The theoretical model was investigated by insertion of radioactive micron-size microspheres into a closed-loop wind tunnel, whose airstream flowed into an electrostatic precipitator. The precipitation pattern on the collection plates was determined by the pattern of radioactivity. Ideally, the particles should be segregated by size. The results were compared to the theoretical predictions which were calculated with a digital computer program. Fourteen runs were made with the 7 plus 3 and 35 plus 5 micron particles using the Scandium-46 isotope. The results indicated good reproducibility and fair overall correspondence between experimental and theoretical data at 750 cm/sec for the 7 plus 3 micron particle and 450 cm/sec for the 35 plus 5 micron particle. The experimental and theoretical results tended to diverge as the particle velocity was increased by 200 cm/sec or the applied voltage was decreased in steps of 5 KV and 2.5 KV. The physical phenomena in the precipitator can be described by mathematical models as suggested in the original theoretical study. The results are reproducible within experimental error; however, the mathematical models being used are probably imperfect. Investigation of the validity of the theoretical model should continue. (Author abstract)

1958

31092 **APTIC NO. 53143**

Saltzman, Bernard E.

KINETIC STUDIES OF THE FORMATION OF SMOG OXIDANT: THE OZONE-1- HEXENE REACTION. *Cincinnati Univ., Graduate School of Arts and Sciences, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1958, 149p. 59 refs.*

Basic analytical procedures for the determination of ozone and oxidants were developed including colorimetry using an iodine reagent. The generation of synthetic smog oxidant by the ozone-1-hexene reaction was also studied. Mass spectrometric data from an investigation of the generation of synthetic smog oxidant by the ozone-1-hexene reaction suggested free radical oxidations of hexene alpha carbon as well as of the double-bonded carbons, with the ozonide not observed. Simultaneous use of two different analytical procedures differentiated the oxidant into synthetic smog oxidant and unconsumed ozone, the reaction yield of the former being 17 to 25%. Part of the synthetic smog oxidant was readily adsorbed on glass and could be subsequently desorbed. An indication of surface reactions consuming hexene was also obtained. The consumption of ozone was first order with respect to both ozone and hexene concentrations through most of the reaction, with a rate constant of 0.0135 per microatmosphere min at 22 to 28 C. Ozone concentration was varied 2000-fold from 0.04 to 80 ppm, hexene concentration 26-fold from 1.4 to 37 ppm, and space velocities six-fold from 0.03 to 0.18 ppm. A more complex picture previously obtained was due to the non-specificity of the iodide reagents employed. The methods developed and the information obtained for the oxidant components should be valuable for further study of smog reactions. (Author abstract modified)

AIR QUALITY MEASUREMENTS

1973

31093 **APTIC NO. 52767**

Ministry of International Trade and Industry (Japan); Ehime Prefectural Government (Japan); and Industrial Public Nuisance Control Assoc. (Japan)

A REPORT OF AN ALL-ROUND PRE-INDUSTRIAL POLLUTION INVESTIGATION IN NIIHAMA AND SAIJO AREAS. *(Niihama. Saijo-chiku sangyo kogai sogo jizen chosa hokoku). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 9(7):682-692, July 1973.*

Pollution in the Niihama and Saijo areas of Ehime Prefecture was studied to prevent future high pollution levels. A wind tunnel diffusion test and diffusion calculations were used to forecast air pollution. Based on forecast results, improved control methods and fuels were determined. Air pollution in Niihama and Saijo will be improved if industries used improved control methods. If industrial control of pollution does not occur, high air pollution concentrations are forecast. These areas may not be able to meet the sulfur oxides environmental standard. Geographical features of these areas make pollution control more difficult. Present air quality measurements are described.

31094 **APTIC NO. 52902**

Council for the Living Environment (Japan)

THE PRESENT STATE AND PROBLEMS OF POLLUTION CONTROL PLANS. *(Kogai boshi keikaku no genjo to kadai). Text in Japanese. March 1973. 221p.*

The result of the Yokkaichi trial has caused revision of environmental standards for many pollutants including sulfur oxides and carbon monoxide. The average SOx concentration of 0.05 ppm for 24 hours, a standard enforced since Jan. 1968, was revised to 0.04 ppm, effective May 15, 1973. The average concentration of nitrogen dioxide must be under 0.02 ppm and that of oxidants must be under 0.06 ppm by the new standard. The air pollution conditions at most areas are expected to improve remarkably in the near future. However, problems still exist in areas such as the large industry complex where the municipal governments have been making every effort to prevent further pollution. Present air quality in Japan is discussed.

31095 **APTIC NO. 53269**

Japan Environmental Agency, Nitrogen Oxides Emission Control Study Committee

INTERIM REPORT OF NITROGEN OXIDES EMISSION CONTROL STUDY COMMITTEE. *(Chissosankabutsu haishutsu kisei kento iinkai chukanhokoku). Text in Japanese. 27p., July 1973.*

The emission of nitrogen oxides should be reduced to 10% of the present level within the next 8 years. The NOx discharged by boilers, nitric acid production, sintering plants, cement plants, and other industries should be regulated on a priority basis. Control methods are needed to reduce the daily average NOx level to below 0.02 ppm in the next 5-8 years, as called for in the new pollution air quality criteria. Stationary sources, mobile sources, home cooking or heating facilities, and chemical reaction plants must also be controlled. Present NOx concentration is twice as high as the criteria of 0.02 ppm. With an annual increase of fuel consumption of 10%, the NOx emission level must be reduced to 1/3.2 of the present level in 5 years if the criterion is to be met. Thermal power stations and factories now discharging an average of 300 ppm of NOx will have to reduce it to 90 ppm.

31096 **APTIC NO. 52861**

Altshuller, Aubrey P.

ATMOSPHERIC SULFUR DIOXIDE AND SULFATE. DISTRIBUTION OF CONCENTRATION AT URBAN AND NONURBAN SITES IN UNITED STATES. *Environ. Sci. Technol., 7(8):709-712, Aug. 1973. 7 refs.*

The interpretation of 1964-1968 results from the U. S. National Air Surveillance Networks indicates that large differences in sulfate levels exist between eastern and western urban and nonurban sites. For eastern urban sites, the overall 5-year average was 13.5 micrograms/cu m versus 6.4 micrograms/cu m for western urban sites. Annual nonurban sulfate concentrations averaged 8.1 micrograms/cu m at eastern sites and 2.6 micrograms/cu m at western sites. Overall 5-year sulfur dioxide averages at eastern and western urban sites were 66 and 22 micrograms/cu m, respectively. Sulfates contribute a larger portion of the sulfur compounds at western sites than at eastern urban sites. The relationship of sulfur dioxide to sulfate is nonlinear over the range of concentrations at urban sites. Statistical relationships were computed relating urban sulfate to urban sulfur dioxide and to the ratio of sulfur dioxide to sulfate. Background levels of water-soluble sulfate differ greatly between the eastern and western U. S. At eastern nonurban sites, a residue sulfate level of at least 5 micrograms/cu m exists. This large residue is attributed to the long-distance transport of sulfur dioxide with conversion of urban sulfur dioxide to sulfate during transport. Sulfate-containing aerosols are broadly distributed throughout large regions of the eastern and midwestern U. S. (Author abstract modified)

31097 **APTIC NO. 52883**

Altshuller, A. P., W. A. Lonneman, and S. L. Kopczynski

NON-METHANE HYDROCARBON AIR QUALITY MEASUREMENTS. *J. Air Pollution Control Assoc., 23(7):597-599, July 1973. 13 refs.*

It is important in the implementation of the air quality standard for ozone/oxidants and nonmethane hydrocarbons to develop quantitative relationships between these pollutants in air quality regions. Analyses for ambient air nonmethane hydrocarbon give a direct measure of the progress in control of hydrocarbon emissions and in the reduction of oxidant/ozone concentration levels. Total hydrocarbon concentrations are much more available than nonhydrocarbon levels. An empirical relationship between total hydrocarbons and nonmethane hydrocarbons were obtained from measurements at both west and east coast sites in the U. S. The comparability of measurements from flame ionization analyzers and gas chromatography was demonstrated. Either analytical technique can be applied to samples collected at monitoring sites to provide the 6-9 am nonmethane hydrocarbon aerometric results specified in the air quality standards. (Author abstract)

31098 **APTIC NO. 52811**

Davison, A. W., A. W. Rand, and W. E. Betts

MEASUREMENT OF ATMOSPHERIC FLUORIDE CONCENTRATIONS IN URBAN AREAS. *Environ. Pollut., 5(1):23-33, 1973. 14 refs.*

Coal and shale are recognized sources of fluoride pollution in Great Britain, but little is known about ground level concentrations in coal-burning areas. A high-volume sampler powered by a portable generator was tested and used to measure fluorides in local mining villages. Modal concentrations were less than 0.05 and about 0.3 micrograms/fluorine/cu m at rural and urban sites, respectively. Concentrations were locally very high near burning pit heaps. Partition of the fluoride using a citric acid impregnated pre-filter showed that most was in a gaseous and therefore phytotoxic form. It is suggested that fluoride concentrations from burning coal could be sufficiently high to damage sensitive plants and could contribute to fluorosis. (Author abstract modified)

31099 **APTIC NO. 53080**

Ferris, Benjamin G., Jr., James R. Mahoney, Robert M. Patterson, and Melvin W. First

AIR QUALITY, BERLIN, NEW HAMPSHIRE, MARCH 1966-DECEMBER 1967. *Am. Rev. Respirat. Disease, 108(1):77-84, July 1973. 12 refs.*

Dust fall and sulfation (sulfate) rates for Berlin, New Hampshire, in 1966 and 1967 are presented. Daily sulfur dioxide data from bubblers in British eight-port smoke samplers did not correlate well with monthly lead peroxide measurements at the same site. Monthly particulate averages of daily high volume samples and 24 hr British smoke readings correlated inversely, while daily values had a positive correlation. If British smoke samplers are to be used in North America for comparison purposes, there is a need for a correlative calibration curve. Smaller filters (1 in. in diameter) are required to produce a darker stain for better precision in reading. Use of lead peroxide candles should be standardized for fixed air movement and air humidity. Long-term integrating samplers, such as peroxide candles, are useful for assessing the effects of chronic, low levels of pollutants on human health. Shorter measurement periods (hours or minutes) are necessary for control purposes and have special value for the study of acute responses in human health. (Author abstract modified)

31100 **APTIC NO. 52816**

Goldman, A., D. G. Murcray, F. H. Murcray, and W. J. Williams

BALLOON-BORNE INFRARED MEASUREMENTS OF THE VERTICAL DISTRIBUTION OF N2O IN THE ATMOSPHERE. *J. Opt. Soc. Am., 63(7):843-846, July 1973. 18 refs.*

The variation with altitude of the infrared solar spectrum in the 4.5 micron region was observed with a balloon-borne spectrometer. Line-by-line and layer-by-layer analysis of the nitrous oxide absorption lines in this region yielded a detailed N2O mixing ratio altitude profile up to about 20 km. The results show a nearly constant mixing ratio of about 0.33 ppm from 3-12 km followed by a gradual decrease to about 0.15 ppm near 19 km. The mixing ratio is estimated to be less than 0.01 ppm above 20 km. (Author abstract)

31101 **APTIC NO. 52693**

Gordon, Robert J. and Robert J. Bryan

AMMONIUM NITRATE IN AIRBORNE PARTICLES IN LOS ANGELES. *Environ. Sci. Technol., 7(7):645-647, July 1973. 14 refs.*

In treatment of airborne particulate matter sampled from Los Angeles air, conventional benzene extracts average 6-9% of the total suspended particulate matter. After their removal, a larger fraction (up to 30% of the total) can be extracted with methanol. This methanol-soluble, benzene-insoluble material is mostly inorganics, predominantly ammonium nitrate. This salt comprises approximately 10-15% of the total airborne particles in composite samples collected over the year 1971-72.

31102 **APTIC NO. 52662**

Hayakawa, Shuji, Sadanori Mizutani, and Noriyoshi Ito

PRESENT STATUS OF ATMOSPHERIC POLLUTION BY TRAFFIC EXHAUSTS IN MIE PREFECTURE. *(Mie-ken kakuchiiki no kotsuhaigasu ni yoru osen no jittai). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 1:116-128, March 1973.*

Pollution was measured at 11 spots in Mie Prefecture. The worst pollution was in front of a traffic control tower on a highway running through Yokkaichi city. The highest values were 778 micrograms/cu m of suspended particulates, 1.64 micrograms/cu m lead, 0.106 ppm nitrogen dioxide, 10.0 ppm carbon monoxide, and 0.156 sulfur dioxide. The pollution in front of the Tsu city office was low, although as many as 3000 cars passed by, due to the width of the road and the absence of nearby high buildings. High pollution occurred in Suzuka city because of the narrow streets, even though traffic was not heavy. Pollution in Ise and Matsusaka cities was low, but is expected to increase with increased traffic. Measurement methods are listed.

31103 **APTIC NO. 53378**

Herceg, Joseph E.

NONRADIOACTIVE MATERIALS. *Los Alamos Scientific Lab., N. Mex. In: Environmental Monitoring in the Vicinity of the Los Alamos Scientific Laboratory. Calendar Year 1972. p. 18-19, 44, March 1973. 18 refs.*

NTIS: LA-5184

Comparison of environmental monitoring results in the vicinity of the Los Alamos Scientific Laboratory with New Mexico ambient air quality standards for the calendar year 1972 revealed the Los Alamos geometric was 28% of the established standard of 60 micrograms/cu m for the annual geometric mean of total suspended particulates. The maximum beryllium concentration was 4% of the permissible 30 day average of 0.01 micrograms/cu m. Total maximum lead and cadmium concentrations were less than 6% of the total heavy metals (atomic number greater than 21) concentration standard of 10 micrograms/cu m over a 30-day average. Sampling was performed on a different day approximately every second week by drawing air at about 1500 l/min through an 8 by 10 inch glass filter provided by the Environmental Protection Agency. The filters were then analyzed for suspended particulate material, benzene-soluble organic material, cadmium, and lead. A similar sampling arrangement was used with a Whatman 41 filter for airborne beryllium measurements. The low levels of nonradioactive atmospheric contaminants tend to reflect the rural location and low concentration of industrial activity in the monitoring area.

31104 **APTIC NO. 52810**

Holt, P. F. and D. K. Young

ASBESTOS FIBRES IN THE AIR OF TOWNS. *Atmos. Environ., 7(5):481- 483, May 1973. 13 refs.*

Many observers have reported that asbestos bodies are present in the lungs of town dwellers who have had no industrial exposure to asbestos, suggesting that asbestos may be a normal contaminant of the urban atmosphere. The air of London, Reading, Rochdale, Bochum, Duesseldorf, Prague, Pilsen, Johannesburg, and Reyjavik was sampled using millipore filters. The samples were transferred to carbon film on a grid and examined by electron microscopy. Asbestos fibers were found in samples from every town. They were mostly present as single fibrils but some were in agglomerates that contained many fibers. (Author abstract)

31105 **APTIC NO. 52858**

Koehler, Albert

INTERNAL AND EXTERNAL AIR CONTAMINATION. *(Luftverunreinigung innen und aussen). Text in German. Klima Kaelte Ing., 1(4):23-24, April 1973. 18 refs.*

Simultaneous measurements of the indoor and outdoor sulfur dioxide concentrations in a room on the 6th story of a modern office building in a busy city street were performed by means of an automatic recording analyzer operating on the conductivity principle. The air sampling for outdoor and indoor concentration measurements was done at a distance of 25 cm from outer wall surface, at a minimum distance of 1 m from inner walls, and 1.2 m over floor, respectively. The outdoor monthly means, determined from an 8-month measurement series, as well as the daily minima and maxima varied in a ratio of 1:3; the range of variation of the indoor monthly averages and of the indoor daily maxima were 5:7 and 1:2, respectively. Attenuation of the indoor concentration fluctuation as compared to the outdoor fluctuations, and its lagging behind the latter were determined. This phenomenon is due to reaction of SO2 with the calcium compounds present in building material to form calcium sulfate. Accordingly, no noticeable differences between the indoor and outdoor SO2 concentrations in another building made entirely of wood were detected.

31106 **APTIC NO. 52674**

Matsui, Takaetsu, Hirohisa Shima, and Motohide Murata

STUDIES ON SUSPENDED PARTICULATES. II. RESULTS OF EXAMINATION. *(Huyuhunjin ni kansuru kenkyu. II. Chosakekka ni tsuite). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 1:37-42, March 1973. 4 refs.*

Suspended particulates were measured between April 1969 and March 1971 in Yokkaichi city. Samples were collected by a high-volume air sampler. Suspended particulates decreased due to legal control of smoke discharge. Yearly changes in the amount of sulfate were less than changes in the amount of total particulate. The average sulfate concentration in 1971 was 17 micrograms/cu m. Nitrates increased and iron and manganese decreased. Lead in 1971 was about half to a third that in 1969. Vanadium concentration increased. The total particualte concentration correlated well with sulfate and nitrate contents. Measurements were made at six points.

31107 **APTIC NO. 52676**

Matsui, Takaetsu, Hirohisa Shima, Syuji Hayakawa, Sadanori Mizutani, Masazumi Kawakami, Noriki Ito, Motohide Murata, and Katsumi Yoshida

STUDIES ON SUSPENDED PARTICULATES. IV. THE RELATION BETWEEN SUSPENDED PARTICULATES AND OXIDANTS (I). *(Huyuhunjin ni kansuru kenkyu. IV. Ryushijobusshitsu to okishidanto no sogokankei (1)). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 1:50-54, March 1973. 3 refs.*

Suspended particulates were measured from July 20 to Aug. 19, 1972 in Yokkaichi. High oxidant concentrations occurred after the particulate concentration increased considerably. Oxidant increased when the sulfate concentration was greater than 20 micrograms/cu m and when the particulate concentration exceeded 100 micrograms/cu m. Oxidant concentration correlated with nitrate concentration. There was little correlation between sulfur oxide concentration and other pollutants. The highest pollution occurred on July 22 when the total suspended particulate concentration reached as high as 350 micrograms/cu m and nitrate reached 230 micrograms/cu m. Samples were collected 15 m from the ground.

31108 **APTIC NO. 52659**

Murata, Motohide

BAD ODOR IN YOKKAICHI CITY. *(Yokkaichi-shi ni okeru akushu mondai ni tsuite). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 1:71-76, March 1973. 20 refs.*

Over 60% of the complaints made to the Yokkaichi City Office concern bad odors. In 1971, of the 688 complaints, 438 were about bad odors. Most complaints occurred in July, followed by August and September. The number of complaints in other months were less than half those in July. In Aichi Prefecture and Okayama Prefecture, 22.2 and 14.7%, respectively, of the complaints concern odors. About 33% of the odors are merely unpleasant, 18.4% miscellaneous, 15.7% unpleasant stimulating odors, 9.5% deteriorated fish odors, 9.1% garlic odors, and 6.9% hydrogen sulfide odors. Most odors were attributable to petroleum refineries. Percentages of odors were 0.091 propylene, 0.002 butene, 0.003 isobutene, 0.002 trans-2-butene, 0.006 1,3-butadiene, 0.015 acetaldehyde, 0.033 isobutyl aldehyde, 0.045 aldehyde, 0.018 total aldehyde, 0.002 H2S, and 0.224 styrene. The highest values were 0.894% propylene and 0.810 styrene.

31109 **APTIC NO. 52675**

Murata, Motohide, Hirohisa Shima, and Takaetsu Matsui

STUDIES ON SUSPENDED PARTICULATES. III. THE RELATION BETWEEN THE VARIOUS COMPONENTS OF SUSPENDED PARTICULATES AND SULFURIC ACID MIST. *(Huyuhunjin ni kansuru kenkyu. III. Huyuryushijo busshitsu to ryusan misuto no sogokankei). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 1:43-49, March 1973. 40 refs.*

Sulfur dioxide, sulfates, sulfuric acid mist, and suspended particulates were measured in Yokkaichi city. The H2SO4 concentration correlated with the SO2 concentration, wind velocity, and vanadium and manganese content of the particulates. When the relative humidity was high, V and Mn concentrations were high, and the H2SO4 concentration sometimes exceeded 10 micrograms/cu m. Ordinarily, H2SO4 concentration was about 1-3 micrograms/cu m. Measurement methods and monitoring station locations are mentioned.

31110 **APTIC NO. 52669**

Naka, Kunihiro, Yasushi Hasegawa, and Hiroshi Hirobe

STUDIES ON HYDROCARBONS PRESENT IN THE YOKKAICHI CITY AREA. *(Yokkaichi-shi ni okeru tankasuisorui ni kansuru kenkyu). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 1:77-93, March 1973. 2 refs.*

A gas chromatograph was used to measure aliphatic and aromatic hydrocarbons in the streets of Yokkaichi in 1972. Propane, iso-butene, iso-butane, 1,3-butadiene, trans-2-butene, cis-2- butene, iso-pentane, i-pentene, n-pentane, 2,2-dimethyl butane, 2,3-dimethyl pentane, 2,3-dimethyl butane, 3-methyl pentane, n-hexane, methyl cyclopentane, 2,2,4-trimethyl pentane, n-heptane, benzene, toluene, m-xylene, o-xylene, and styrene were measured. Measurements when a smog alarm was issued showed no special saturated hydrocarbon concentrations; however, unsaturated HC values were extremely high just before the high oxidant concentrations were measured. Benzene, toluene, and xylene concentrations were high near a petroleum refinery.

31111 **APTIC NO. 52719**

Odaira, Toshio

THE CONDITION AND ROUTE FOR THE FORMATION OF PHOTOCHEMICAL AIR POLLUTION AND ITS PRESENT SITUATION IN JAPAN. *(Kokagaku hanno ni yoru taikiosen no hassei keiro to zittai). Text in Japanese. PPM (Japan), 4(7):18-31, July 1973. 16 refs.*

The photochemical air pollution situation was studied in Tokyo and compared with data from Los Angeles. The atmosphere in the Tokyo area contains the same secondary pollutants as in Los Angeles. The concentration of oxidants in Tokyo is lower than that in Los Angeles, but the concentrations of sulfur dioxide and suspended particulates are higher in Tokyo. The concentration of oxidants exceeded 0.1 ppm/h for 98% of the days between July and September in 1970 in Los Angeles, but for only 15-30% of the days in the same period in Tokyo. The corresponding values for SO2 were 45% for Los Angeles and 70% for Tokyo. The effects of meteorological variables were established from observations and measurements. The concentration of oxidants was at a maximum when the intensity of sunshine was 50 cal/sq cm/h. Over this value, the temperature difference between the land and the sea became so high that the wind from the sea diluted the oxidant concentration. Concentrations of primary air pollutants were highest under windless conditions, while those of secondary air pollutants were higher under stronger winds (1.0-5.0 m/sec).

31112 **APTIC NO. 52660**

Shima, Hirohisa, Takaetsu Matsui, Motohide Murata, Yutaka Kuroda, and Katsumi Yoshida

MEASUREMENTS OF HYDROGEN SULFIDE CONCENTRATIONS AND THE DISTRIBUTION OF CONCENTRATIONS IN YOKKAICHI. *(Ryukasuiso nodo no kakushusokuteiho to Yokkaichi-shi ni okeru sons bunpujokyo ni tsuite). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 1:108-112, March 1973. 10 refs.*

The zinc acetate cylinder, membrane filter, tape air sampler, and methylene blue methods for measuring hydrogen sulfide in air are discussed. Measurements of H2S using these methods were made in four areas of Yokkaichi city Shiohama, Goki, Kusunoki, and Amagasuka. The mean and maximum concentrations at Shiohama were 246 ppb and 1540 ppb, respectively. The lowest maximum concentration was 0.35 ppb at Kusunoki. The lowest average concentration was 0.53 ppb at Kusunoki.

31113 **APTIC NO. 52850**

Shinya, Mitsuzo

THE PROGRESS OF THE SURVEY RESEARCH ON PHOTOCHEMICAL AIR POLLUTION AND THE OUTLINE OF THE RESULTS. *(Kokagaku hanno ni yoru taiki osen chosa no keika to kekka gaiyo). Text in Japanese. PPM (Japan), 4(7):41-56, July 1973. 9 refs.*

Photochemical air pollution was studied in Tokyo Bay (including Tokyo, Kanagawa, Chiba, and Saitama Prefectures) in the summer of 1972. During the survey period, 14 warnings were given of which 10 occurred in more than two Prefectures at once and four in a single Prefecture. High oxidant concentrations thus occurred over a large area. Oxidant formation areas correlated well with daily variation of the front zone. The hourly average maximum and the maximum instant value of oxidants correlated; the difference between these values was about 0.03 ppm or less. The hourly average maximum oxidant value was high when nitrogen oxides and hydrocarbons were high between 6 and 9 am. As altitude increased, nitric oxide and nitrogen dioxide decreased and non-methane hydrocarbons and carbon monoxide increased. In Aug. 1973 in Shakujii, Nerima-ku, the concentrations of NO, CO and non-methane HC were relatively high along roads and decreased when traffic was regulated. The concentrations of these pollutants in residential areas 100 m from the roads were relatively low, and no difference was observed between normal traffic conditions and regulated traffic conditions.

31114 **APTIC NO. 52809**

Shoji, Hikaru and Tsuneo Tsukatani

STATISTICAL MODEL OF AIR POLLUTANT CONCENTRATION AND ITS APPLICATION TO THE AIR QUALITY STANDARDS. *Atmos. Environ., 7(5):485-501, May 1973. 8 refs.*

A statistical model of the time series which gives the relations between air pollutant concentration, averaging time, and frequency of occurrence is described. The percentile concentration with respect to averaging time is expressed by two functions. One of them is the probability density function, which is approximated by the log-normal distribution, and the other is the spectrum density function, approximated by the Markoffian spectrum. The mathematical application of the method to the air quality standard for sulfur oxides in Japan is discussed and a procedure for making the standard consistent with recommended threshold values is given. (Author abstract modified)

31115 **APTIC NO. 53228**

Warmbt, W. and G. Herrmann

RESULTS OF SO2 CONCENTRATION MEASUREMENTS PERFORMED IN THE EAST BERLIN TV AND VHF TRANSMITTER TOWER. *(Ergebnisse von SO2-Immissionsmessungen am Fernseh- und UKW-Turm der Hauptstadt der DDR). Text in German. Idojaras (Budapest), 77(2):69-79, March-April 1973. 11 refs.*

Sulfur dioxide concentration measurements were performed at a 241 m altitude on the East Berlin TV and VHF transmitter tower in 1969, and the results were compared with corresponding results from simultaneous measurements conducted in East Berlin at groung level, and in air pollution monitoring networks throughout East Germany. The mean SO2 concentrations obtained for the October-March and April-September periods from measurements at ground level and on the tower were 0.13 and 0.03 mg/cu m, as well as 0.11 and 0.03 mg/cu m, respectively; the yearly averages for the high altitude and ground level measurements were 0.08 and 0.09 mg/cu m. The SO2 values obtained during the heating period at 241 m altitude were 10 to 20% higher than such obtained at ground level, while no difference between the measured values in the summer period was observed. Statistically significant correlation between the daily average SO2 concentrations measured on the transmitter tower and the vertical temperature gradient within the lower 3 to 360 m layer of air was established. The SO2 concentrations were higher in anticyclonal than in cyclonal situations. Formula for the determination of the SO2 mean flux density in g/sq m/sec as a function of wind direction and wind velocity was derived.

1972

31116 **APTIC NO. 52541**

Philadelphia Dept. of Public Health, Pa., Air Management Services

EMISSION INVENTORY/AIR QUALITY DATA. *27p., June 1972.*

The status of pollutant emission reductions in Philadelphia and the corresponding trends in air quality measurements were studied with respect to emission inventory and air quality data for 1965-1971. The major emission categories included residential, commercial, and industrial fuel combustion, electric power generation, transportation, industrial processes, and refuse incineration. The pollutants of interest were carbon monoxide, hydrocarbons, nitrogen oxides, sulfur oxides, and particulates. The air quality charts indicated a downward trend for concentrations of suspended particulates, sulfur dioxide, CO, total oxidants, and non-methane hydrocarbons and a slight upward trend for nitrogen dioxide.

31117 **APTIC NO. 53005**

Lee, Robert E., Jr.

THE SIZE OF SUSPENDED PARTICULATE MATTER IN AIR. *Science, vol. 178:567-575, Nov. 10, 1972. 23 refs.*

The National Air Surveillance Network (NASN) cascade impactor can fractionate particles from 0.5-3.5 micron in diameter and can collect enough particulate matter on each of several stages over a 24-hour period to permit the gravimetric determination of particle size distributions. Data obtained with this instrument show that particulate matter suspended in urban air in the U. S. and Great Britain is remarkably uniform in distribution and that particles are predominantly smaller than 1 micron. In Ankara, Turkey, the high proportion of particles greater than 1 micron is associated with incomplete combustion of lignite; particulte concentrations in Ankara are, however, considerably higher than those measured elsewhere. Aerosol growth during temperature inversions occurs in Cincinnati, and the larger aerosols undoubtedly account for the reduced visibility during inversion conditions. Aerosols immediately adjacent to highways have a larger average size and are consequently less likely to be deposited in the respiratory system than aerosols further away from the roadway turbulence area. Aerosols inside buildings are predominantly smaller and exhibit a narrower range of sizes than aerosols outside buildings. A four-stage impactor that collects samples at 20 cu ft/min, and can be installed on a high-volume sampler, may permit greater resolution of particle sizes than the NASN cascade impactor. Complete measurements of particle sizes, together with knowledge of the chemical composition of aerosol fractions and of trends in condensation nuclei, could lead to better methods of pollution control. (Author conclusions modifi..)

31118 **APTIC NO. 52671**

Noda, Yukio, Masaru Murata, Yumiko Masumoto

RESULTS OF AN INVESTIGATION ON ATMOSPHERIC POLLUTION IN 1969. *(Showa 44 nendo taiki osen chosa seiseki). Text in Japanese. Kumamoto-ken Eisei Kenkyushoho (Annu. Rep. Kumamoto Prefect. Inst. Pub. Health), 1972:162-191, March 1972.*

Atmospheric temperature, humidity, wind velocity and direction, carbon monoxide concentration, suspended particulates,, nitric oxide, nitrogen dioxide, sulfur dioxide, noise, and the number of cars in Kumamoto Prefecture were measured in 1969. All values were lower than those obtained in the previous year, except at Udo City, due to new regulations and increased pollution control in factories. The increase in Udo City was caused by a new plant producing carbide by open electric furnaces. Sulfur dioxide, carbon monoxide, and nitrogen oxides increased.

31119 **APTIC NO. 53494**

Okawa, Tomio, Hisanori Okuda, Shiro Tsukada, Toshihiko Kamata, and Hiroko Fujimori

DETERMINATION OF DUST DEPOSIT AND SO2 (PBO2 METHOD) IN HIROSHIMA. *(Hiroshima shi ni okeru koka baijin ryo oyobi aryusan gasu sobutei seiseki). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), no. 20:405-411, Dec 1972. 22 refs.*

From April 1967 to March 1970, dust deposits and sulfur dioxide at 13 sites in Hiroshima were measured using British Standard Deposit Gauges and lead peroxide candles, respectively. Dust deposit averaged 7.4 tons/sq km/mo and SO2 averaged 0.3 mg SO3/day/100 sq cm. The dust deposit increased in spring and summer, presumably as a result of the rainy season (June) and the typhoon season (August-September). Sulfur dioxide increased in winter due to increased fuel consumption. Air pollution levels in Hiroshima are low in comparison with other industrial cities.

1971

31120 **APTIC NO. 52578**

Blosser, E. R. and W. M. Henry

IDENTIFICATION AND ESTIMATION OF IONS, MOLECULES, AND COMPOUNDS IN PARTICULATE MATTER COLLECTED FROM AMBIENT AIR. (FINAL REPORT). *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Air Pollution Control Office Contract CPA 70-159, Rept. APTD-0705, 77p., July 23, 1971.*

NTIS: PB 201738

The inorganic components of particulates in ambient urban air were qualitatively and quantitatively determined from samples collected on millipore and glass filters in Cincinnati, Denver, St. Louis, Washington D. C., Chicago, and Philadelphia. Analytical techniques included chemical analysis, including atomic absorption spectrophotometry, colorimetry, and combustion analysis; optical emission spectrography; spark-source mass spectrometry; X-ray fluorescence; combination mass spectrometry- vacuum fusion; and direct vacuum fusion extraction. The samples were analyzed for contents of all the metal compounds, arsenic, bromine, chlorine, fluorine, hydrogen, iodine, nitrogen, oxygen, phosphorus, selenium, silicon, carbon, and sulfur.

31121 **APTIC NO. 52982**

Zeigler, G. S., R. J. Charlson, and Samaria H. Forler

MT. RAINIER: NOW YOU SEE IT, NOW YOU DON T. *Weatherwise, 24(3):114-119, June 1971. 16 refs.*

The Seattle, Washington, area may slowly be losing its view of Mt. Rainier. During 1968, the mountain was visible from Seattle only 43% of the days. An attempt was made to correlate the Seattle air pollution level (measured by observation of the coefficient of light scatter) with visibility of the mountain, and to estimate the pollution level corresponding to initial loss of the view. From light scatter observations associated with 28 cases of threshold visual clarity, a wind rose diagram was plotted; the results are consistent with the location of the air pollution sources relative to the data sampling sites. For calm or light easterly winds, the lowest allowable ratio of Seattle horizontal visibility to Mt. Rainier distance is about one to ten, and for light westerly winds it is about one to three. The prevailing visibility is approximately equal to 3.8/B, where B is the light scattering coefficient.

1970

31122 **APTIC NO. 53408**

Kauranen, Pentti and Marja Lansimaki

STABLE LEAD AND RADIOLEAD IN AIR FILTER SAMPLES. *In: Radioactive Foodchains in the Subarctic Environment. Annual Report of the Period Aug. 15, 1969 - Aug. 14, 1970. Helsinki Univ. (Finland), Dept. of Radiochemistry, Atomic Energy Commission Grant At (30-1)-3446, Paper 32, 3p., 1970. 3 refs.*

NTIS: NYO 344614

A set of aerosol samples were collected from Helsinki, from Nurmijarvi (rural area in southern Finland), and from Sodankylu (rural area in the southern part of Lapland) in an effort to determine the specific activity of lead in aerosols and its dependence on locality, season, and weather conditions and to test the possibility of using lead (210) as a natural tracer for that part of stable lead which is taken up by inhalation. The specific activity of lead in ground-level air was considerably lower in Helsinki than in rural areas. Higher specific activities were found in Sodankyla both under high pressure (stable) and low pressure (unstable) winter and summer weather conditions due to the production (relatively) of more airborne radiolead than stable lead. The situation was more confused in Nurmijarvi and Helsinki, presumably because of man-made stable lead sources in those regions. The specific activity of airborne lead generally appeared to vary in wide limits (about three orders of magnitude) thus limiting the usefulness of 21OPb as a tracer for lead in aerosols.

31123 ***APTIC NO. 52575***

Yunghans, R. S. and T. B. McMullen

FLUORIDE CONCENTRATIONS FOUND IN NASN SAMPLES OF SUSPENDED PARTICLES. Fluoride, 3(3):143-152, July 1970. 8 refs.

Samples of suspended particles collected at various urban sites in the National Air Sampling Network were analyzed for contents of the fluoride ion. Of the over 7700 measurements, 87% were at fluoride concentrations below 0.05 micrograms/cu m, i.e., the threshold of detectability; 0.2% exceeded 1.00 micrograms/cu m, with 1.89 micrograms/cu m as the maximum; and 0.2% exceeded 0.10 micrograms/cu m. Ninety-seven percent showed no detectable amounts of the fluoride ion. The maximum levels were well below most of the published standards for a 24-hour average concentration. (Author summary modified)

ATMOSPHERIC INTERACTION

1973

31124 **APTIC NO. 52727**

Japan Environmental Agency, Tokyo (Japan), Air Quality Bureau

GENERAL OUTLINE OF RESULT OF SURVEY ON AIR POLLUTION CAUSED BY PHOTOCHEMICAL SMOG REACTION. *EPI Environ. Prot. Ind., 4(2).16-27/March/April 1973.*

A comprehensive survey of photochemical air pollution in the Tokyo Bay area was conducted in the summer of 1972. The survey covered ground level pollution, lower atmosphere pollution, the effects of oxidants on human health, a smog chamber study of photochemical reactions, and pollution sources. Ground level pollution was measured continuously with automatic instruments; pollution in the lower atmosphere was surveyed using airplanes, helicopters, balloons, pilot balloons, and radiosondes. The occurrence of photochemical air pollution was closely related to the changes and appearance of local winds or the shifting of the sea breeze front. Oxidant ground level concentrations correlated with the altitude and strength of inversion layers. Oxidant formed in a wide area, and its hourly maximum concentration tended to increase with an increase in nitrogen oxides and hydrocarbons during morning hours. The composition of aromatic hydrocarbons, analyzed by gas chromatography, noticeably resembled that of automotive exhaust gas. Aldehyde and peroxyacetyl nitrate concentrations, and sulfates and nitrates in particulates tended to increase when oxidant concentration was high. Ozone concentrations increased with altitude, while nitric oxide and nitrogen dioxide concentrations decreased with altitude. Concentrations of sulfur oxides varied greatly with changes in altitude. An increase in ozone concentration was observed when ultraviolet rays were introduced into a smog chamber containing ambient air. These results indicate that the conditions for photochemical air pollution in the Tokyo Bay area in summer are similar to those existing in Los Angeles. Data on the health effects of oxidants and on pollution sources are still being analyzed.

31125 **APTIC NO. 52933**

Tokyo Scientific Center (Japan)

A FEASIBILITY STUDY ON THE PREDICTION AND CONTROL SYSTEM FOR AIR POLLUTION. *(Taiki osen no yosoku to seigyo notame no shisutemu ni kansuru fijibiriti sutade). Text in Japanese. 42p., March 8, 1973. 17 refs.*

To solve the existing environmental problems, countermeasures including the elimination of pollutants and the restoration of the destructed, the deterioration prevention by feedback, and occurrence prevention by prediction have to be carried out. Pollutants such as polychlorinated biphenyl which is extraordinarily stable after being distributed in the natural environment have to be restricted for use and the stable pollutants must be recovered. The environment improvement by feedback includes the development of pollution preventing techniques and of measuring methods, the clarification of the pollution mechanism, and the transmittance, treatment, and control of data. The pollution occurrence prevention by prediction requires the development of a forecasting model. The feasibility of a sensor system which monitors pollution and meteorology and uses the data to predict future pollution concentrations when combined with a weather forecast is discussed.

31126 **APTIC NO. 53170**

Japan Environmental Agency, Tokyo, Air Quality Bureau

REFERENCES ON PHOTOCHEMICAL AIR POLLUTION IN JAPAN. *353p., May 1973. 10 refs.*

The problems of photochemical air pollution in Japan, specifically in Tokyo, Osaka, and Nagoya, are reviewed. The steady increase of photochemical pollution, its physical and chemical phenomena, and the meteorological and industrial conditions conductive to the development of smog are presented. The effects of photochemical pollution on human health and on plants are discussed, and various studies and laboratory tests done to examine the phenomena are listed and described. Measures to prevent air pollution caused by photochemical reactions are listed, including emission control measures, air surveillance and continuous monitoring systems, and the studies done on determining air quality criteria for nitrogen oxides and photochemical oxidant control.

31127 **APTIC NO. 53270**

Ministry of International Trade and Industry (Japan), Environmental Protection and Safety Bureau

AIR POLLUTION PREDICTION SYSTEM. *(Taiki osen yosoku shisutemu ni tsuite). Text in Japanese. Kankocho Kogaisenmon Shiryo (Public Nuisance Gaz.), 8(4):83-99, July 1973.*

The air pollution prediction system is a computerized total system performing air pollution prediction and control primarily for an industrial area where a number of industrial complexes are located. Technical problems involved in development of the system include establishment of theoretical models, determination of diffusion factors, programming for various calculations, improvement of the calculation method, and expansion of applicable range. The prediction system can be used to predict possible changes in air pollutant distribution when factors affecting distribution of the pollutants such as relocation of plants in the area occur. Also, using air pollution patterns programmed on the basis of wind tunnel experiments or field surveys, it can predict overall local air pollution. Based on the predictions obtained by the system, government or public offices concerned can provide the enterprises with appropriate administrative guides for prevention of air pollution. When it is combined with an air pollution monitoring/control system, the air pollution prediction will be immediately fed back to emission sources, thereby controlling the sources in advance to prevent air pollution. Functions of a standard air pollution control system are also outlined.

31128 **APTIC NO. 53427**

INSTRUCTIONS FOR CALCULATING THE ATMOSPHERIC DISPERSAL OF NOXIOUS SUBSTANCES (DUST AND SULFUR DIOXIDE) PRESENT IN INDUSTRIAL EMISSIONS. *(Ukazaniya po raschetu rasseivaniya v atmosfere vrednykh veschestv (pyli i sernistogo gaza) soderzhaschikhsya v vybrosakh promyshlennykh predpriyatiy). In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. At-*

mospheric Pollutants in Relation to Meteorological Conditions; A Procedure For Calculating the Atmospheric Dispersal of Pollutants and the Feasibility of Their Study by Means of Satellites. M. Y. Nuttonson (ed.), Vol. 21, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 96-141, APTD-1482. Translated from Russian. NTIS: PB 222351

Instructions are presented for calculating the dispersal of noxious substances (dust and sulfur dioxide) present in the emissions of industrial facilities and boiler houses. The procedure is based on the determination of the concentrations of these substances in the ground layer of air and extends to organized discharges of these substances past purification devices and without purification in cases where the latter is permitted by the sanitary standards; the procedure does not extend to ground level emission sources. The degree of danger posed by pollution of the ground layer of air with such emissions is determined from the largest value of the ground concentration of the noxious substances which can be established at a certain distance from the emission source under unfavorable weather conditions (when the wind velocity reaches a dangerous value and a vigorous vertical turbulent exchange takes place). The values of the maximum concentration (in mg/cu m) for each noxious substance must not exceed the highest one-time maximum permissible concentrations of these substances in the atmosphere. For sulfur dioxide and nontoxic dust, the one-time maximum permissible concentrations are equal to 0.5 mg/cu m.

31129 **APTIC NO. 52564**

Braslau, N.

OVERLAP EMISSIVITY OF CO2 AND H2O IN THE 15-MICRON SPECTRAL REGION. *IBM J. Res. Develop., 16(2):180-183, March 1973. 16 refs.*

Radiative transfer in model atmospheres including carbon dioxide, water vapor, ozone, and clouds can be explored by computer simulation for the purpose of predicting the mean temperature at the surface of the earth. Where two or more gases have overlapping absorption lines, the overlap emissivity determined from the band-averaged expressions is a possible source of uncertainty. This method has been tested in a 250/cm region around 15 micron where the carbon dioxide absorption overlaps the tail of the water vapor rotation band. Published high resolution spectra of these gases enable the overlap effects to be calculated for small spectral intervals and summed over the band. This calculation was made and compared with the value given by the approximate treatment for the same gas concentrations, pressure, and temperature. Agreement was within 10%, indicating that the more detailed spectral calculation is unnecessary. (Author abstract modified)

31130 **APTIC NO. 52754**

Braslau, Norman and J. V. Dave

EFFECT OF AEROSOLS ON THE TRANSFER OF SOLAR ENERGY THROUGH REALISTIC MODEL ATMOSPHERES. PART I: NON-ABSORBING AEROSOLS. *J. Appl. Meteorol., 12(4):601-615, June 1973. 36 refs.*

Extensive calculations aimed at determining the effect of aerosols on the solar energy absorbed, reflected, and transmitted by cloudless, nonhomogeneous, plane-parallel atmospheric models were recently carried out with the object of treating the radiation transfer in as comprehensive a manner as possible consistent with reasonable computing time. The concentration of aerosol (spherical particles with size distribution and refractive index independent of height), ozone, and water vapor were specified for 160 layers of varying thickness from the surface to 45 km. The solar spectrum (0.285-2.5 microns) was divided into 83 intervals with appropriate functions representing the scattering and absorption of gases and aerosol assigned to each, the index of refraction of the aerosol taken to be wavelength-independent. Upward and downward fluxes for each spectral interval at each level were computed taking into account all orders of scattering. Results are presented for four model atmospheres to show the absorbed, diffusely reflected, and diffusely as well as directly transmitted (spectrally integrated) solar flux for a range of Lambert ground reflectivities and solar zenith angles. The first model is free of aerosols and absorbing gases. The remaining models contain carbon dioxide, ozone, and water vapor representative of average summer mid-latitude conditions. The second model contains no aerosol; the third contains an aerosol distribution typical of average clear sky conditions; and the fourth has increased aerosol concentration near the ground and in the Junge layer located in the lower stratosphere. (Author abstract modified)

31131 **APTIC NO. 52942**

Brocco, D. and G. Sirilli

AN EVALUATION OF THE RELATION BETWEEN SULFUR DIOXIDE AND SOME METEOROLOGICAL FACTORS. *(Una stima della relazione tra il biossido di zolfo ed alcuni fattori meteorologici). Text in Italian. Inquinamento, 15(2):24-28, March 1973. 4 refs.*

A mathematical model expressing the relationship between SO2 and the average between maximal and minimal daily temperature in C, barometric pressure in mb, humidity in %, precipitation in mm, wind velocity in m/sec and wind direction was constructed on the basis of measurement data collected in Rome by the Laboratory for Atmospheric Pollution which measured SO2 by the colorimetric method and data supplied by the Meteorological Service. Temperature had a major influence on SO2 concentration in urban areas in winter. The higher the barometric pressure, the bigger the probability of atmospheric stagnation. Increasing levels of SO2 accompanying increasing humidity are probably due to reduced dispersion of the pollutant with the hygroscopic gas adsorbed by the droplets of humidity. Winds from the north always increased SO2 concentration, southern winds decreased it. Wind velocity tended to dilute pollution, and hence to diminish it. Rain had little effect on SO2 pollution levels. A major element of imprecision in the model is the distance between the location where the pollution levels were measured and the location where the meteorological observations were recorded.

31132 **APTIC NO. 53016**

Brosset, Cyrill

AIR-BORNE ACID. *Ambio, 2(1-2):2-9, 1973. 16 refs.*

The formation and transport of airborne acid is discussed. Sulfur dioxide is emitted by industries and oxidized in the stack to sulfuric acid which is emitted to the ambient air. When emitted to the ambient air, drops of concentrated H2SO4 pick up water and eventually form drops of approximately 5 M H2SO4. The SO2 not oxidized in the stack also reacts with water droplets in the atmosphere to eventually form H2SO4. The acidic precipitation can cause many harmful effects to the environment, including acidification of lakes. Local sources and distant sources cause deposition and washout of particle-borne acid. Soot and particles in Scandinavian countries contain sulfate, ammonium, iron, and aluminum ions. The toxic and synergistic effects of SO2 and soot are mentioned. Measurements of particle-borne acid might be a better index of potential health hazards than the measurements of SO2 currently being performed. The dispersion of SO2 under conditions of good atmospheric ventilation, inversion, and acceptable ventilation with entering air masses containing particles from distant sources is mentioned.

31133 **APTIC NO. 53426**

Burnazyan, A. I., B. A. Bogdanov, L. F. Glebova, V. M. Kozlov, V. V. Malakhova, G. I. Solomina, E. N. Teverovskiy, and G. V. Chernega

POLLUTION OF THE GROUND LAYER OF THE ATMOSPHERE DURING TEMPERATURE INVERSIONS. *(Zagryazneniya prizemnogo sloya atmosfery pri tem-*

peraturnykh inversiyakh). In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Atmospheric Pollutants in Relation to Meteorological Conditions; A Procedure for Calculating the Atmospheric Dispersal of Pollutants and the Feasibility of Their Study by Means of Satellites. M. Y. Nuttonson (ed.), Vol. 21, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 9-65, APTD-1482. 69 refs. Translated From Russian. (Also: Izdatelstvo Meditsina, Moscow, USSR, 1969.)

NTIS: PB 222351

Cases of disastrous atmospheric pollution in industrial centers during periods of windless weather and temperature inversion point to high concentrations of sulfur dioxide combined with products of its oxidation in the ground layer of atmospheric air. The most significant sources of pollution in such centers are the incomplete combustion of fuel and sulfur oxides discharged in large quantities with flue gases from public, residential, and industrial boiler rooms and thermal electric power plants. The illnesses of the population were characterized by injuries to the respiratory organs and irritation of the mucous membranes of the eyes, nose, pharynx, and respiratory tract. The most sensitive group among the populations were infants, people over 40-55 years of age, and those suffering from cardiovascular and lung diseases. Some measures of reducing the amount of pollution in the air are: the use of natural gas as the fuel in boiler houses and thermal electric power plants, the use of low-sulfur fuels, purification of the flue gases of electric power plants, the construction of high stacks, and prediction of meteorological conditions under which the formation of dangerous concentrations of atmospheric pollutants is possible.

31134 **APTIC NO. 52844**

Chow, Tsaihwa J., Kenneth W. Bruland, Kathe Bertine, Andrew Soutar, Minoru Koide, and E. D. Goldberg

LEAD POLLUTION: RECORDS IN SOUTHERN CALIFORNIA COASTAL SEDIMENTS. *Science, 181(4099):551-552, Aug. 10, 1973. 10 refs.*

The present anthropogenic lead fluxes into sediments from the Santa Monica, San Pedro, and Santa Barbara basins of Southern California, as determined by mass spectrometry and atomic absorption, are, respectively, 0.9, 1.7, and 2.1 micrograms of lead/sq cm of sea bottom/yr. The natural (prepollution) rates for these three basins are, respectively, 0.24, 0.26, and 1.0 microgram of lead/sq cm/yr. Studies of isotopic composition indicate that lead pollutants in coastal sediments are derived mainly from the combustion of lead additives in gasoline. The daily lead fallout in the Southern California coastal area is computed to be 0.5 ton. (Author abstract modified)

31135 **APTIC NO. 53144**

Dodge, Marcia C.

WORKSHOP ON MATHEMATICAL MODELING OF PHOTOCHEMICAL SMOG: SUMMARY OF THE PROCEEDINGS. OCTOBER 30-31, 1972. *National Environmental Research Center EPA-R4-73-010, 53p., Jan. 1973.*

NTIS: PB 221177

A workshop on the modeling of photochemical smog formation attended by members of industry, the academic community, and the Environmental Protection Agency illustrated the considerable efforts of both the Chemistry and Physics Laboratory and the Division of Meteorology (Environmental Protection Agency) in developing photochemical models to assess air quality. Descriptions are given of smog chamber studies at the University of North Carolina and Battelle Memorial Institute, the Los Angeles atmospheric measurement program, the St. Louis RAPS undertaking, studies to define the role of aerosols, new instrumental techniques to aid the identification of trace contaminants, and the efforts underway to employ these data to develop a photochemical mechanism. A set of chemical reactions are reviewed, and an assessment is made of the suspected relevancy of each reaction in describing atmospheric transformation processes. Reactions for which the rates of reaction are unknown or imprecisely determined and those reactions for which the intermediates and products are unknown are determined. Suggestions are offered on the type of smog chamber systems to be studied, the measurements that should be made, the desired accuracy of these measurements, the various chamber effects that ought to be elucidated, and the reaction product species that ought to be monitored. (Author summary modified)

31136 **APTIC NO. 53181**

Eiden, R. and G. Eschelbach

THE ATMOSPHERIC AEROSOL AND ITS INFLUENCE ON THE ENERGY BUDGET OF THE ATMOSPHERE. *(Das atmosphaerische Aerosol und seine Bedeutung fuer den Energiehaushalt der Atmosphaere). Text in German. Z. Geophys., 39(2):189-228, May 1973. 136 refs.*

Studies on the effect of atmospheric aerosol on the energy budget of the atmosphere, and possibly on the climate are reviewed. Apart from water vapor, oxygen, ozone, carbon dioxide, and aerosol, a non-selective absorber, is present in the atmosphere. The size of aerosol particles ranges from 0.001 to 100 micron. Increase of the aerosol concentration beyond the tropopause, with a maximum at 20 km, and abrupt decrease at higher altitudes was determined. Strong dependence of the size and properties of atmospheric aerosol on the relative humidity was observed. The heat absorption by aerosol particles, and its effect on the energy balance of the atmosphere were studied in model calculations, using formulae describing radiative transitions. An average heat input of 0.05 cal/sq cm at a heat absorption rate of 40% was calculated. An increase in the ground layer aerosol concentration led an increase in the air temperature, and possibly to a fall in temperature in urban and desert areas. Another theory prophesizes a drop of 3.5 C in the temperature of the surface due to an increase of the air pollution to four times the present level.

31137 **APTIC NO. 53326**

Elshout, A. J.

AIR POLLUTION BY SULFATES AND SULFURIC ACID. A REVIEW OF MEASUREMENT DATA PUBLISHED IN THE PAST. *(Luchtverontreiniging door sulfaten en zwavelzuur. Overzicht van elders depubliceerde meetresultaten). Text in Dutch. Elektrotechniek, 51(7): 370-375, June 1973. 34 refs.*

Comparative measurements of the atmospheric sulfates, sulfur dioxide, sulfuric acid, and total sulfur concentrations are reviewed. Close correlation, with a coefficient of 0.9, between the atmospheric sulfuric acid content and the second power of the SO2 concentration was established. With a SO2 concentration of 5650 micrograms/cu m, a sulfuric acid concentration of 678 micrograms/cu m was measured in London in Dec. 1972. Increase in the H2SO4 concentration with increasing humidity was observed during measurements in Moscow. Dominant effect of solid aerosol particles on the catalytic conversion of SO2 into H2SO4, little effect of ammonia, and negligible influence on the catalytic process of nitrogen dioxide were observed. The rate of SO2 conversion, determined as the ratio of nominal H2SO4 to total sulfur, was a function of the ozone concentration within an SO2 concentration range of 145-165 micrograms/cu m. The considerable proportion of all atmospheric sulfates was present in the form of ammonium sulfate.

31138 **APTIC NO. 52813**

Hagen, Arne and Arnfinn Langeland

POLLUTED SNOW IN SOUTHERN NORWAY AND THE EFFECT OF THE MELTWATER ON FRESHWATER AND AQUATIC ORGANISMS. *Environ. Pollut., 5(1):45-57, 1973. 29 refs.*

The effects of airborne pollution on lakes and brooks in Fyresdal and Tokke in Telemark County, southern Norway, were investigated. In winter, surface water in some oligodystrophic lakes differed physicochemically from what might be expected. Analyses of snow and of ice-trapped and surface water showed that polluted snow had a considerable influence on the quality of water in lakes and brooks in the winter and spring. Great quantities of sulfate, nitrate, zinc, and lead were found together with high acidity. The Zn concentration and acidity are dangerous to fish. The polluted water may also have an adverse effect on invertebrates. It is probable that oligotrophic lakes are more susceptible to contamination than dystrophic lakes. Presumably, the pollutants are brought to Norway by low pressure systems passing industrial and urban areas in Western and Central Europe. (Author abstract modified)

31139 APTIC NO. 52702

Hess, W. and A. Haerter

CALCULATION OF THE DISPERSION OF CO EXHAUST GASES FROM AUTOMOBILES IN BUSY STREETS. *(Berechnung der Ausbreitung von CO-Abgasen aus Kraftfahrzeugen an verkehrsreichen Strassen). Text in German. Schweiz. Bauztg., 91(32);769-773, 1973. 5 refs.*

On a busy five-lane highway along Lake Zurich in Switzerland CO and wind measurements were taken continuously during a 2-month period. Six measurement stations were erected, one directly at the street curb, the others 4, 12, 20 and 40 m away from the highway. During Feb. and March 1971, more than 48,000 individual results were obtained. All samples were taken 1.2 m above street level. The CO analysis was based on the infrared absorption of CO. The measurements were taken with the aim of determining more general connections concerning exhaust gas dispersion in the vicinity of highways. For this it was necessary to find the diffusion constants for an equation concerning pollutant dispersion, to verify the common assumptions concerning exhaust gas emission and to find a simplified dispersion law suitable for approximations. For the calculation of the pollutant concentrations along a street, it was assumed that each lane is a line source for which the equation by Sutton can be used. The influence of each individual lane on the pollutant concentration alongside of the highway was determined. Based on the average exhaust gas emission per unit area, the influence of each emission source distributed across the width of the highway on a point outside the highway was determined by integration of a simplified Sutton equation. The exhaust gas dilution with increasing distance from the highway depends on the diffusion exponent only and not on the wind velocity. An evaluation of the measured data yielded the same result. By using an average diffusion exponent, the measured average concentration decrease could be calculated with the derived equation with good accuracy. A simplified equation was derived for determination of the approximate CO concentration alongside the highway in the countryside without buildings.

31140 APTIC NO. 53183

Inlenfeld, H.

STUDIES CONCERNING THE MIXING PROCESS OF GAS STREAMS. *(Untersuchungen zur Vermischung von stroemenden Gasen). Text in German. Maschinenbautechnik, 22(4):158-161, April 1973. 6 refs.*

A theoretical and experimental study of the mixing process of gas streams is described. The relationship between the turbulent diffusion coefficient and degree and structure of the turbulence, as well as Reynolds number, characteristics of flow fields, was established. A linear relationship between the turbulent diffusion coefficient and Reynolds number is assumed to exist. Density stratification within a flow field has, depending on the gradient, attenuating or activating influence on oscillatory motion, which is of particular interest for gas propagation at ground level. The intense cool-off of the ground through radiation in the evening hours is able to attenuate turbulent oscillations to such a degree that laminar flow establishes, thereby inhibiting the mixing of gases in the lower layer of the atmosphere. Good agreement between measurements of the concentration distribution in free jets with literature data was determined.

31141 APTIC NO. 53063

Johnson, Francis S.

SSTS, OZONE, AND SKIN CANCER. *Astronaut. Aeronaut., 11(7):16-21, July 1973. 17 refs.*

Supersonic transports (SSTs) are expected to reduce the amount of ozone in the Earth s atmosphere. A reduction in O3 would increase ultraviolet radiation and thus the incidence of skin cancer; the magnitude of this effect is not known, but is expected to be by a factor of three. The expected O3 reduction would be due to the introduction of nitric oxide from engine exhausts into the stratosphere. The increase in NO would decrease O3 formation due to photochemical reactions in the atmosphere. Meteorological circulation effects, zonal average excess carbon-14 in the stratosphere, and the photochemical reactions involving O3 are discussed. Nuclear weapons testing has introduced additional nitrogen oxides to the atmosphere; the effect of this NOx on O3 has been studied. The best photochemical evidence available indicates that increased NOx in the stratosphere should significantly reduce O3, while increased water vapor might or might not cause a reduction. The ozone increase during the past decade is probably associated with the gradual loss of bomb-injected NOx from the stratosphere. Skin cancer is caused by the cumulative effects of exposure to ultraviolet radiation in the spectral range 290-320 nm; since ozone absorption reduces ultraviolet radiation, the amount depends on the ozone path length that the sunlight must traverse, which in turn depends on the amount of O3 in the atmosphere. Possible toxic effects of increase of ultraviolet radiation due to a decrease in O3 concentration in the atmosphere are discussed.

31142 APTIC NO. 52704

Kainz, Gerald, Gustav Boehm, and Ferdinand Schoeller

THE HEAVY METAL CONCENTRATION OF SNOW SAMPLES, GROUND AND SURFACE WATER. *(Ueber den Schwermetall-Gehalt von Schneeproben, Grund- und Oberflaechenwaessern). Text in German. Gas/Wasser/Waerme, 27(4):84-88, 1973. 4 refs.*

The lead, zinc, cadmium, copper, and nickel concentrations in snow samples were determined. Since these are pollutants emitted by automobile exhausts, the snow samples were taken at points with heavy traffic and at points with very little traffic. The snow of a 1 sq dm area was taken. Since the snow samples contained soot particles, 500 ml of the samples were evaporated each time with 20 ml concentrated nitric acid plus 5 ml concentrated hydrochloric acid and 5 ml hydrogen peroxide. The residual matter was mixed with 10 ml concentrated HCl, diluted with water, heated to the boiling point and filtered. The filtrate was replenished with HCl to 100 ml. The lead concentration was determined by inversion polarography; zinc, cadmium, copper and nickel were determined by a.c. polarography. The lead concentration in the snow samples depended on the traffic density, on the steepness of the street, on the wind strength and wind direction, on the distance to the street, on the age of the snow, and on the thickness of the snow cover. On an area of 1 sq dm next to the street, 8 times 10 to the -9th power g lead are precipitated per automobile. This value agrees with the results of examinations of soil samples which turned out 1 times 10 to the -9th power g lead/automobile/sq dm. At a distance of 100 m from the street 10% of the lead quantity emitted per automobile was measured. Zinc was measured in the snow in quantities similar to lead. It was still measured 70 m from the street. Occasionally cadmium could be found too. The lead concentration in surface water was 0.000010 g/1000 ml in ground water the concentration was between 0.000003 and 0.000005 g/l water.

31143 **APTIC NO. 53040**

Kiang, C. S., D. Stauffer, and V. A. Mohnen

POSSIBILITIES FOR ATMOSPHERIC AEROSOL FORMATION INVOLVING NH3. *Nature Phys. Sci., 244(134):53-54, July 23, 1973. 9 refs.*

Trace gases in the atmosphere, such as hydrogen sulfide, sulfur dioxide, ammonia, nitrogen dioxide, and some organics, are considered as potential formers of aerosols; aerosols less than 0.1 micron in radius result from chemical reactions in the gas phase involving those gases. Although the exact mechanisms of aerosol formation are unclear, the fact that the ammonium ion is a very common constituent of aerosols less than 1 micron and of precipitation confirms the participation of ammonia in the overall phase transition process. A model is proposed for the formation of aqueous aerosols involving NH3. The nucleation process and chemical reactions associated with the formation of ammonium sulfate are mentioned. Water vapor plays an extremely important role in heteromolecular nucleation and can change the rate of nucleation by many orders of magnitude at varying relative humidities less than 100%.

31144 **APTIC NO. 52714**

Kubo, Tomohiro

SOLAR RADIATION AND AIR POLLUTION. *(Nissha to taiki osen). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 2(6):396-398, June 1973. 7 refs.*

The effect of air pollution on solar radiation intensity was investigated using records correlating suspended particulate concentration increase with solar radiation decrease. Suspended particulate concentrations increased with the beginning of industrial operations and had a marked effect on solar radiation after 9 am. Solar radiation increased with a wind velocity increase to 5 m/sec. In the cold season, the total solar radiation value in Osaka was 20% lower than that in the mountains, with an annual difference of 11%. At a suspended particulates concentration of 0.1 mg/cu m, total solar radiation decreased about 10%. At concentrations exceeding 0.2 mg/cu m, the decrease in radiation was proportional to the concentration of suspended particulates.

31145 **APTIC NO. 53425**

Maksimovich, G. A.

CHEMICAL COMPOSITION OF ATMOSPHERIC PRECIPITATION OF THE CITY OF PERM AND CONTROL OF ATMOSPHERIC POLLUTION. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Atmospheric Pollutants in Relation to Meteorological Conditions; A Procedure for Calculating the Atmospheric Dispersal of Pollutants and the Feasibility of Their Study by Means of Satellites. M. Y. Nuttonson (ed.), Vol. 21, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 90-95, APTD-1482. 10 refs. Translated from Russian. (Also: Akad. Nauk SSSR, Ural. Filial. Komis. Okhrane Priody. Okhrana Prirody na Urale. II, p. 45-50, 1971.) NTIS: PB 222351*

Atmospheric precipitation in the city of Perm is characterized by a mineralization from 56-245 mg/l, with the highest indices pertaining to the winter period for snow. Sulfur, bicarbonate, and calcium ions predominate in the precipitation. As the weather becomes warmer and the combustion of coal (containing large amounts of pyrite and ash) declines, the content of sulfates (from pyrite) and bicarbonate, calcium, and iron (from ash) decreases. Products of incomplete fuel combustion which have relatively little influence on the chemical composition of atmospheric precipitation do, nevertheless, form a smoke screen that remains suspended at different heights and absorbs sunlight, particularly in the ultraviolet region, which is of major biological importance for the population s health and the growth of vegetation. Moreover, a calculated annual 25,000-50,000 cu m of dust settle on the city and account for the high mineralization of atmospheric precipitation. This dust combined with gases also has an increased irritating effect on the respiratory organs. Conversion to gas heating, the introduction of a district heating system, a smokeless process of fuel combustion, systematic sprinkling of streets, planting of greenery, and other measures are being implemented on an increasingly larger scale to insure a reduction of the smoke pollution in the city. The concentrations of bicarbonate, sulfate, chloride, nitrate, nitrite, calcium, magnesium, ammonium, sodium, and iron in the precipitation are listed.

31146 **APTIC NO. 53127**

Martinez, J. R., R. A. Nordsieck, and A. Q. Eschenroeder

IMPACTS OF TRANSPORTATION CONTROL STRATEGIES ON LOS ANGELES AIR QUALITY. *General Research Corp., Santa Barbara, Calif., Environmental Protection Agency Contract 68-02-0336, EPA-R4-73-012, Vol. d, CR-4-273, 8p., May 1973. 5 refs.*

NTIS: PB 221301

A photochemical/diffusion simulation model is employed to evaluate four control strategies for reducing air pollution in Los Angeles. Three representative air trajectories (for which validation tests have been run) serve as baseline cases using 1969 emission levels. Transportation controls are emulated by reducing source emissions in accordance with hypothetical plans worked out with the Division of Meteorology of the Environmental Protection Agency. Straight reductions of vehicle miles traveled do not give ozone reduction percentages that are as large as the emission reduction percentages. The strong influence of initial pollutant load of the air in the morning is noted. Day-to-day pollution carryover must be carefully adjusted through the initial conditions to account for continuous strategies in contrast with intermittent strategies. Ratios of nitrogen oxides to reactive hydrocarbon affect the ozone buildup markedly. The control of the mixture ratio can be more important than straight reduction in emissions. The four control strategies are: 30% reduction in carbon monoxide, reactive HC, and nitric oxide from mobile sources only; a nearby vehicle free area involving a 90% reduction in mileage traveled in downtown Los Angeles; 62% CO reduction, 79% reduction in reactive HC emissions from mobile sources plus 63% cut in initial load, and 73% reduction in NO emissions from mobile sources plus a 58% cut in initial NOx load; and total elimination of all emissions.

31147 **APTIC NO. 53525**

Mathis, Joe J., Jr. and William L. Grose

A REVIEW OF METHODS FOR PREDICTING AIR POLLUTION DISPERSION. *National Aeronautics and Space Administration, Langley Research Center, 47p., 1973. 119 refs.*

NTIS: NASA SP-322

A review of models for predicting air pollution dispersion reveals that all of the models developed a solution by assuming the effluent dispersed according to a Gaussian distribution or, alternatively, by solving some form of diffusion equation. Such models were formulated for application to a specific area and will not work well for an area different from that for which they were designed. Recommendations which are directed only to those aspects of modeling which promise to improve modeling capabilities significantly in the near future and to enable the utilization of models in determining pollutant contributions are listed. An extensive network of measurement sites should be established in the air quality control regions to collect regularly adequate meteorological and air quality data. Techniques should be developed to measure turbulence properties as a function of height over urban regions. Reaction rates for postulated photochemical reactions, particularly those involving olefinic compounds, should be measured in controlled laboratory experiments. A dispersion model should be developed based on an initial value integration of the time-dependent continuity, momentum, and energy equations coupled with the diffusion equation. Functional representations which can correctly represent time-varying emission rates should be constructed for all types of pollution sources and should be incorporated into the dispersion model. The influence of topography upon the meteorological field should be included in the dispersion model. Highway and airport models and plume behavior are mentioned.

31148 APTIC NO. 52692

Matsumoto, Toshiro

OXIDANTS AND UV LEVELS IN URBAN ATMOSPHERES. *(Toshi taikichu no okishidanto oyobi shigaisen reberu). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(7):727-732, July 1973.*

The relationship between photochemical oxidants and ultraviolet rays was studied from May to Dec. 1971 in Tokyo. Oxidants were determined by spectrophotometry using a neutral potassium iodide solution, and ultraviolet rays were measured by an instrument capable of measuring 310-400 nm ultraviolet radiation and 700-1200 nm infrared radiation. One-hour oxidant concentrations were 0.1-28.5 pphm; 5% of the year s values were 20 pphm; 1% of the values averaged more than 10 pphm/day. Ultraviolet rays occurred most frequently in the summer, particularly in August. The maximum 1-hour ultraviolet ray value was 387.5 mw min/sq cm; the maximum amount/day was 2512.5 mw min/sq m; the maximum average value/mo was 1599.4 mw min/sq cm. Photochemical oxidants occurred when ultraviolet ray concentrations were high on both fine and cloudy days.

31149 **APTIC NO. 52749**

Meyer-Abich, Klaus M.

THE GOOD THING ABOUT THE ENERGY CRISIS. *(Das Gute an der Energiekrise). Text in German. Umwelt (Duesseldorf), 3(4):26-29, 1973. 6 refs.*

Most of the major air pollutants in the atmosphere today stem from energy conversion processes. Thus a limitation of these processes would benefit the environment. Whenever energy is used for heating or cooling, illumination, transportation, or communication, almost all of it goes after a short time into the atmosphere in the form of waste heat. The temperature of our atmosphere is increased indirectly through the rising carbon dioxide, water vapor, and aerosol concentrations in the atmosphere and directly through heat emission. Carbon dioxide and water vapor are not a barrier to incoming solar radiation but are for the outgoing albedo. Combustion of all fossil fuels would quadruple the atmospheric CO2 concentrations. Doubling of this concentration would raise the average temperature by two centigrades. The effect of aerosols is still widely debated. It is assumed that their rising concentration also causes a temperature increase. The world-wide fuel shortage is forcing consideration of more economic ways of using energy. Examples of this exist already. Railroads in West Germany, for instance, have increased their capacity by 50%, while cutting down their energy consumption between 1950-1970 by one-half. Some automobiles consume 30-40% less fuel due to an aerodynamically favorable shape. Considerably better heat insulation of buildings is feasible, as are better heating systems (e.g., the heat pump).

31150 **APTIC NO. 52720**

Moriguchi, Minoru

METEOROLOGICAL CONSIDERATION OF PHOTOCHEMICAL SMOG. *(Kokagaku sumoggu no kishogakuteki kosatsu). Text in Japanese. PPM (Japan), 4(7):74-80, July 1973. 9 refs.*

The formation of photochemical smog with relation to meteorological parameters was studied and compared for the Tokyo and Osaka areas and Los Angeles. The major variables with respect to smog formation in Los Angeles are nitrogen oxide concentration, wind speed, inversions, and solar radiation. The reaction rate of formation increases with an increase in temperature. In the Tokyo and Osaka areas, however, localized low pressure areas develop on hot days and the strong winds from the sea dilute the oxidant concentration. The balance of wind speed and direction greatly affect the formation of smogs.

31151 **APTIC NO. 52688**

Nishizawa, Toshie

URBAN CLIMATE -- ESPECIALLY HEAT ISLANDS. *(Toshi kiko -- Tokuni hiito airand ni tsuite). Text in Japanese. Kagaku (Science), 43(8):487-494, Aug. 1973. 50 refs.*

Air pollution in urban areas may cause a heat island effect. This high temperature area is discussed in relation to its size, the variation in its locality, and the temperature difference between the heat island and rural areas or between varying heights. The three-dimensional heat island structure and urban temperature heat balance are also discussed.

31152 **APTIC NO. 52690**

Parkinson, G. S. and W. M. Catchpole

THE USE OF ISOTOPIC RATIO AS A MEANS OF DETECTING SOURCES OF LEAD EMISSIONS. *J. Inst. Petrol. (London), 59(566):59-65, March 1973. 29 refs.*

The published works on the use of lead 206/204 as an isotope tracer are reviewed. Isotopic ratios of lead 206/207 can be used to supplement the data obtained on lead 206/204. These isotopes have half lives measured in billions of years and are therefore stable. There are also several references in the literature for the use of lead 210 but this has a half life period of only 22 years and is a product of the radioactive decay of radon 222. The use of naturally occurring isotopes in lead emitting sources has only very limited application in determining the origin of a specific source. (Author abstract modified)

31153 **APTIC NO. 53424**

Petrenchuk, O. P. and V. M. Drozdova

CHEMICAL COMPOSITION OF CLOUD WATER IN URBAN INDUSTRIAL DISTRICTS UNDER VARIOUS WEATHER CONDITIONS. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Atmospheric Pollutants in Relation to Meteorological Conditions; A Procedure for Calculating the Atmospheric Dispersal of Pollutants and the Feasibility of Their Study by Means of Satellites. M. Y. Nuttonson (ed.), Vol. 21, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 81-89, APTD-1482. 8 refs. Translated from Russian. (Also: Trudy, Glavnaya Geofiz. Observ. A. I. Voeykova, no. 238:201-209, 1969.)*

NTIS: PB 222351

The chemical composition of water taken from clouds in the eastern regions of the European Territory of the USSR over the three year period of 1965-1968 under various synoptic conditions was analyzed for the following ions: sulfate, chloride, nitrate, bicarbonate, ammonium, sodium, potassium, magnesium, and calcium. The data indicate that the chemical composition of cloud water is greatly influenced by meteorological conditions and that water from clouds forming in the absence of inversions is much less mineralized than that from subinversion clouds. Samples from clouds forming during periods of prolonged existence of an anticyclonic situation indicate the concentration of impurities to be still higher. In all of the samples the predominant anion was sulfate with a content of 74-97% of the total anion composition. Chloride content ranged from 2.4 to 24%. The most abundant cation was ammonium with a range of 18 to 46%. Water from frontal clouds contained a small amount of impurities amounting to 8 mg/l total. A high pollution level was produced over a considerable part of the east of the European Territory under conditions of distinct anticyclonic situation and a weak turbulent exchange.

31154 **APTIC NO. 53226**

Phan-Cong Luan

ATMOSPHERIC ELECTRICITY AND ELECTRONIC PRECIPITATION OF POLLUTANTS. *(Electricite atmospherique et precipitation electrostatique des polluants). Text in French. A.I.M., Liege, 86(1):57-65, 1973. 45 refs.*

Atmospheric electricity, electrostatic precipitation of pollutants and the crown effects are related phenomena. The relationship was studied in two laboratories by studying the effect of atmospheric electricity on the coalescence of droplets microscopically. An ultrasonic nebulizer produced droplets whose trajectories were photographed under a microscope against a black background. Two phenomena emerged: elastic collision between droplets with subsequent separation, and coalescence between droplets with initially parallel trajectories. The collision coefficient was determined and was an almost linear function of the electric field between 0 and 400 V/cm. In ongoing experiments, a twin goal is being pursued: to increase precipitation effectiveness of small particles and to reduce consumption of electricity at the same time. The solution of the problems is being approached by rendering the small particles of a size smaller than 0.8 micron slightly electrolytic and by the use of surface active agents to reduce discharge tension threshold.

31155 **APTIC NO. 52779**

Ramachandra Murty, A. S. and Bh. V. Rama Murty

ROLE OF DUST ON RAINFALL IN NORTHWEST INDIA. *Pure Appl. Geophys. (Basel), vol. 104:614-622, 1973. 9 refs.*

The interdependence between local dust, thermal stability of the air, and precipitation were examined from the available data of two selected pairs of years (1961-1962 and 1964-1965) for Delhi in northwest India. Data showing the concentrations of hygroscopic and non-hygroscopic aerosols present in the giant size range (radius of 1 micron and above) in the surface air layers were obtained from cascade impactor measurements. The indications are that the dust enters into the precipitation picture by virtue of its role in radiation balance during the relatively dry period from January to June and by virtue of its role in cloud microstructure during the wet period from July to September. (Author abstract modified)

31156 **APTIC NO. 53047**

Rozenberg, G. V.

ON AN ESTIMATE OF ABSORPTION OF ATMOSPHERIC HAZE BY CLOUD BRIGHTNESS. *(K otsenke pogloshchatel noy sposobnosti atmosfernoy dymki po yarkosti oblakov). Text in Russian. Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana, 9(5):460-470, 1973. 32 refs.*

A method is proposed for the evaluation of the humidity absorption of atmospheric haze from the cloud brightness. The absorption in clouds outside the molecular absorption bands was determined to be both intense and to be caused mainly by the finely dispersed fraction which is responsible for the generation of humidity hazes. The volume absorption coefficient due to haze in the visible spectral range is close to 0.06/km, while that for the coarsely dispersed dust fraction is 0.01/km. While coarsely dispersed, insoluble [illegible] particles actively participate in the condensation process below dew point temperature, the finely dispersed fraction, though actively absorbing humidity, is unable to assume the role of condensation nuclei, and thus coexists with the rest of the cloud mass practically unchanged, and is able to color the cloud. The existence of coarse condensation nuclei is of little influence on cloud optical parameters.

31157 **APTIC NO. 52885**

Shefov, Nicolai Nicolaevich

RELATIONS BETWEEN THE HYDROXYL EMISSION OF THE UPPER ATMOSPHERE AND THE STRATOSPHERIC WARMINGS. *Gerlands Beitr. Geophys., Leipzig, 82(2):111-114, 1973. 18 refs.*

Intensity, vibrational and rotational temperatures of the hydroxyl emission at Zvenigorod, USSR, exhibit disturbed variations occurring 10-12 days after stratospheric warmings in the arctic region. The quasi-biannual variations of the hydroxyl emission are evidently connected with similar variations of the stratospheric circulation and warmings. (Author summary modified)

31158 **APTIC NO. 52866**

Storebo, Per B.

COAGULATION INVOLVING MOLECULE-SIZE NUCLEI. *Aerosol Sci., vol. 4:337-338, 1973. 4 refs.*

The immediate result of radioactive gas decay or chemical trace gas reactions should be single atoms or molecules of non-gaseous matter in the air. These particles associate themselves with gas, vapor, or air molecules, and the compounds formed coagulate and form aggregates. Part of the coagulation process involves shedding of loosely-held gas molecules. Thus the embryo radius used in the coagulation mass equation should be that of a molecule or slightly greater, and the adhesion of foreign molecules should be taken into account only in coefficients for diffusion, mobility, and coagulation.

31159 **APTIC NO. 52884**

Sutugin, A. G., A. A. Lushnikov, and G. A. Chernyaeva

BIMODAL SIZE DISTRIBUTION IN HIGH DISPERSED AEROSOLS. *Aerosol Sci., vol. 4:295-305, 1973. 12 refs.*

A combination of dynamical diffusion experiments and electron microscopy shows that the size distribution of high dispersed aerosols can be bimodal. By means of computer simulation of condensation in the presence of foreign nuclei it was shown that such size distributions can be formed if both the collision efficiency between clusters and vapor molecules and the rate of deposition of particles on the walls depend on cluster size. (Author abstract modified)

31160 **APTIC NO. 53078**

Svoboda, J.

THE APPLICABILITY OF SIMPLE FORMULAS FOR THE CALCULATION OF GASEOUS PLUME DIFFUSION. *Idojoras (Budapest), 77(2):80-86, March-April 1973. 4 refs.*

The case of a sharp discontinuous change of the heat flux at the beginning of the coordinate system is modeled. The change of the vertical temperature lapse rate due to the change of the flux of heat in the atmosphere is found by two methods: the derivative of the basic equation for heat flux and the calculation of the heat diffusion from the supplementary area source of heat. The comparison of the two methods is used to verify the quality of Pasquill's atmospheric diffusion formula and to find the values of the vertical exchange coefficient as the consequence of the application of the Pasquill formula.

31161 **APTIC NO. 53029**

Wood, C. M.

VISIBILITY AND SUNSHINE IN GREATER MANCHESTER. *Clean Air, 3(9):15-24, Spring 1973. 13 refs.*

The amounts of visibility, sunshine, and fog in Manchester are reviewed. There is considerable evidence to suggest that fogs associated with visibilities of less than 400 m are water fogs, with smoke having some contributory effect. Fogs in the visibility range of 400-1000 m are chiefly due to smoke. Frequencies of poor visibility at the Manchester/Ringway airport during the winter are presented expressed as percentages of observations for each range of wind speed. The number of days with fog per month at 0900 GMT (visibility less than 1000 m) and with dense fog at any time of the day or night (visibility less than 500 m) are listed. Percentages of hourly observations with visibility less than specified values during individual months and years are listed for Manchester Airport. The smoke and sulfur dioxide concentrations at Manchester Airport and in central Manchester in different months of the years from 1962-1970 and from 1959-1970, respectively, are also given. These concentrations declined during the 1960s. Improvement in visibility and decrease in fog frequency due partially to this decline in pollution concentrations. The daily mean sunshine duration at the airport is given as a percentage of possible sunshine. The general improvement in visibility was correlated with an increase in the amount of sunshine; increased sunshine also correlated with decreased air pollution due to smoke controls.

31162 **APTIC NO. 53221**

Zuev, V. E., L. S. Ivlev, and K. Ya. Kondratyev

NEW RESULTS OF INVESTIGATIONS OF THE ATMOSPHERIC AEROSOLS. *(Novyye rezul taty issledovaniy atmosfernogo aerozolya). Text in Russian. Izv. Akad. Nauk SSR, Fiz. Atmosfery i Okeana, 9(4):371-385, 1973. 46 refs.*

Optical, microphysical, and chemical studies of atmospheric aerosols in the ground layer, troposphere, and lower stratosphere, conducted at the Leningrad and Tomsk Universities, are reviewed. Dependence of the vertical structure of aerosols on latitude was confirmed. The seasonal and diurnal variations of the aerosol vertical structure are likely to be due to the periodicity of the vertical movements of air masses. Relatively high concentration of giant aerosol particles, no pronounced dependence of the concentration of solid aerosol particles on relative humidity, nearly regular concentration maxima in the morning and evening hours, and dominance of silicon, iron, aluminum, calcium, and magnesium in aerosol particles were determined for the ground layer aerosol. The maxima of the aerosol attenuation are due to the absorption of infrared radiation by giant silicate and carbonate particles. Intense washout by cloud droplets of aerosol particles and a major modifying effect on the aerosol vertical structure of the ascension of dust particles were determined for the troposphere. The stratospheric aerosol particles constituted complex aggregates of tiny particles of different chemical compositions. While the concentration of submicron particles abated negligibly with an altitude from 20 to 27 km, particles larger than 4 micron were practically absent in the lower stratosphere. For relative humidities below 80%, the swelling and water shell hypotheses were unacceptable. Condensation on rough surfaces and coagulation, dependent on the value of the relative humidity, more probably represent mechanisms of condensation.

1972

31163 **APTIC NO. 53442**

Pickard, Lowe, and Associates, Inc.; Research Corp. of New England; and General Public Utilities Service Corp.

ATMOSPHERIC DIFFUSION EXPERIMENTS WITH SF6 TRACER GAS AT THREE MILE ISLAND NUCLEAR STATION UNDER LOW WIND SPEED INVERSION CONDITIONS. *135p., Jan. 1972. 7 refs.*

NTIS: DKT-50289-50

The diffusion of sulfur hexafluoride tracer gas over flat terrain within a valley and in the turbulent wake of large structures during low wind speed inversion conditions was satisfactorily described by models which account for plume dispersion. Model 1P (AEC/DRL Delta T Model) which is the common Gaussian equation (corrected for wake effects) with Pasquill stability categories based on vertical temperature structure is overly conservative during these conditions. This experimental program validated the use of Model 5W (Sector Average Wake Model), which is a more appropriate, yet conservative, model for prediction of diffusion during periods of low wind speed inversion (nighttime) conditions. (Author conclusions)

31164 **APTIC NO. 53540**

CHEMIST-METEOROLOGIST WORKSHOP. II. *Atomic Energy Commission, 68p., Jan. 1972. 36 refs.*

NTIS: WASH-1217

The reports of four panel discussions by meteorologists and chemists on environmental contamination are presented. Over 35 important trace substances in the atmosphere, 20 in situ methods for their identification, and nine methods for collecting the samples are identified. Three problem areas in the cycle of gaseous and particulate trace substances in the atmosphere are atmospheric aerosols, the influence of trace substances on the budget of stratospheric ozone, and the generation and transport of trace substances which may be toxic to some portion of the atmosphere. Six areas of information critical to the understanding of the long range transport of pollutants through the atmosphere are compilation of an accurate inventory of air pollution emissions of chemical substances from land based sources; measurements of specific chemical substances far from the points of injection into the atmosphere; comparative measurements of closely related chemical substances; coordinated measurements of pollution gases and air pollution particulates with complete meteorological observations taken at the time and place of sampling; improved dynamic models for long range dispersion; and analytical chemical techniques for sampling and measurement. The basic problems in regional studies of atmospheric pollution from near surface sources were discussed. Past, current and planned urban field investigations that are relevent to regional air pollution studies were discussed, and recommendations applying specifically to the current and planned studies in the St. Louis area were presented.

31165 **APTIC NO. 53218**

Admirat, P.

THEORETICAL AND EXPERIMENTAL DIFFUSION OF SILVER IODIDE NUCLEI EMITTED BY GENERATORS. *(Diffusion theorique et experimentale de noyaux d iodure d argent emis par des reseaux de generateurs). Text in French. J. Rech. Atmospheriques, 6(1-2-3):13-27, Jan.-Sept. 1972. 15 refs.*

Theoretical and experimental studies were conducted bearing on the diffusion of silver iodide nuclei and on the conservation of their glaciogenic properties following diffusion from a single source. A simple mathematical model was constructed and results were compared with measurements of concentrations of active nuclei of silver iodide downwind from different generator distribution patterns. One such source serving for the prevention of hailstorms had generators 17 km apart, others 10 and 4 km, one source was a 21 km long line of generators 0.4 km apart. The numbers of glaciogenic nuclei before, during, and following emission were determined by special analyzers placed at ground level. In the case of diffusion by the line source with wind velocity between 10 and 15 m/sec downwind measurements at distances of 7, 12, 25, and 40 km disclosed that cumulative deactivation increased from 40 to 92% with an extension of the stay of the nuclei in the atmosphere from 14 to 80 min. A disagreement was noted between theoretical and experimental findings which was attributed to deactivation of the silver iodide nuclei. Whatever the cause, emissions from sources 10 km apart had almost no glaciogenic effect, while a distance of 4-5 km increased the effect 100 fold from its natural level. Hourly deactivation was 90%.

31166 **APTIC NO. 53343**

Arya, S. P.

THE CRITICAL CONDITION FOR THE MAINTENANCE OF TURBULENCE IN STRATIFIED FLOWS. *Quart. J. Roy. Meteorol. Soc. (London), 98(416);264-273, April 1972. 23 refs.*

Theoretical models for predicting the critical Richardson number for the maintenance of turbulence in a stratified atmosphere are re-examined in the light of recent observations. It is proposed that the critical condition may first arise from the failure of the maintenance of steady shear in the presence of buoyancy forces. An expression for the critical flux Richardson number is derived from the consideration of the equations of Reynolds stress and turbulent energy. This gives a range of 0.15 0.25 for R sub fcr, in agreement with the results of direct observations. (Author summary)

31167 **APTIC NO. 52812**

Atwater, Marshall A.

THERMAL EFFECTS OF URBANIZATION AND INDUSTRIALIZATION IN THE BOUNDARY LAYER: A NUMERICAL STUDY. *Boundary-Layer Meteorol., 3(2):229-245, Dec. 1972. 22 refs.*

A numerical model developed by Pandolfo was used to compute changes in temperature resulting from changes in the physical characteristics of the surface due to urbanization and from the addition of radiatively active pollutants, such as a carbonaceous aerosol, that are characteristic of urbanization and industrialization. The model was simplified by omitting advection and by holding the pollutant concentration constant in time. The results show that changes in the physical properties of the surface, and not pollutants are the dominant factors in creating the urban heat island. Changes in the vertical thermal structure are caused by changes in the surface temperature near the surface and by the presence of pollutants at higher levels. (Author abstract)

31168 **APTIC NO. 53142**

Bergstrom, Robert William, Jr.

THEORETICAL STUDY OF THE THERMAL STRUCTURE AND DISPERSION IN POLLUTED URBAN ATMOSPHERES. *Purdue Univ., Lafayette, Ind., Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., Aug. 1972, 209p. 238 refs.*

A mathematical model for the atmospheric radiation transfer and the one-dimensional mass, momentum, and energy transport in the planetary boundary layer was constructed. The atmosphere was considered to absorb, emit, and scatter anisotropically radiant energy. A series of numerical simulations of the thermal structure and pollutant dispersion in the urban atmosphere was performed for summer and winter conditions, with and without an elevated inversion. The modification of the temperature and concentration distributions by the radiatively participating pollutants was investigated. The results indicate that accurate solar flux predictions require the knowledge of the total amount of pollutants and the fraction of absorbing particles. Small quantities of absorbing particles and nitrogen dioxide caused large increases in the solar heating rates. In the numerical simulations the aerosol pollutants reduced the solar radiant flux at the surface, which in turn lowered its temperature during the day. The lower temperature decreased the instability near the ground, increased slightly the pollutant concentration, and hindered the break-up of a stable region. The additional solar heating due to the pollutants caused the atmosphere to be slightly warmer at higher altitudes. Under the conditions investigated, the largest surface temperature reduction was 2 C, and the maximum rise of the atmospheric temperature due to the additional solar heating was about 1 C after a 2-day period. The gaseous pollutants increased the downward thermal radiation flux and raised the surface temperatures at night. The higher temperatures reduced the stability of the atmosphere near the ground and enhanced the pollutant dispersion. The peak night-time pollutant concentration was lowered by as much as 40%. The maximum predicted surface temperature increase was about 3 C after a 2-day simulation. The pollutant gases enhanced the net radiative cooling only for nonuniform concentration distributions. This additional cooling modified both the night-time stable layer and the elevated inversion by causing an upward motion of the stable regions. The elevated inversion became higher, thus reducing the pollutant concentrations in the planetary boundary layer. Therefore, the radiatively participating pollutants had the potential for significant changes in the thermal structure and pollutant dispersion capability of an urban atmosphere. (Author abstract)

31169 **APTIC NO. 53364**

Bouscaren, R.

THE PROBLEM OF CO2. EVOLUTION OF THE ATMOSPHERIC CO2 LEVELS IN PARIS. A COMPARISON WITH SO2. *(Le probleme du CO2. Evolution des teneurs dans l atmosphere. Cas particulier de Paris. Comparaison avec SO2). Text in French. Centre Interprofessionnel Technique d Etudes de la Pollution Atmospherique, Paris (France), Rept. 38, CI-728, 16p., Oct. 18, 1972. 10 refs.*

The accumulation and elimination of atmospheric carbon dioxide in the air was compared with that of sulfur dioxide in Paris air. Studies with respect to CO2 included the carbon cycle, photosynthesis, and the dispersion of CO2. Particular attention was directed at the production, concentration and dispersion of CO2 and compared to the behavior of SO2 in the atmosphere. The production of these gaseous contaminants of the atmosphere was studied in terms of the consumption of combustibles (coal, fuel oil, gas, and petroleum) over periods from 1960 to 1970. The CO2 was eliminated from the Paris air by the normal process of dispersion, and there was only a slight increase in atmospheric CO2 during the period studied, amounting to about 15% of the initial concentration. It is estimated that by 1980 the CO2 concentration will reach about 380 ppm in the Paris area. In spite of a considerable increase in emission of SO2, its rate of disappearance from the atmosphere has doubled within the last 10 years. The increase in consumption of fuel oil in Paris, which is the main source of SO2, is counteracted by the installation of incinerators with high chimneys in connection with industrial and city areas. The SO2 produced is thus removed from the immediate areas where it is produced and is diluted over large areas. The SO2 also tends to be transformed to form sulfur trioxide and to disappear partially in the form of sulfates in the dust. The CO2 does not undergo such changes, which accounts for its accumulation.

31170 **APTIC NO. 53365**

Bouscaren, R.

ACIDITY OF RAINWATER ON THE LEE AND ON THE WINDWARD SIDE OF AN EXTENDED SO2 EMISSION SOURCE. *(Acidite des eaux de pluie au vent et sous le vent d une source etendue de SO2). Text in French. Centre Interprofessionnel Technique d Etudes de la Pollution Atmospherique, Paris (France), Rept. 38, CI-727, 14p., Oct. 18, 1972. 1 ref.*

Rainwater was analyzed for acidity, samples being collected from eight different locations in and around Paris where the emission of sulfur dioxide for extended periods could be expected to form sulfuric acid in combination with rainwater. The locations selected for testing were also considered in terms of the direction of the wind which could create areas of higher SO2 concentration. The analyses revealed that there was no correlation between the quantity of rainfall and the corresponding pH, both for cities and rural areas; heating during the winters did not increase the acidity to any significant degree in spite of the emission of about twice the quantities of

SO2. In two locations a correlation was found between acidity and SO2. It cannot be concluded from the results that the emission of SO2 has no effect on the rainwater falling on the peripheral locations, situated between 20 and 100 km from the center. The meteorologic cycle between the formation of a cloud and the subsequent rainfall must be considered; pH measurements of the samples collected may not actually represent the rainwater itself but may include the dust and other impurities of those areas; shorter time intervals for collection of samples may be more accurate for pH measurements, especially when changes in direction of wind may occur, and results obtained from rural areas may not be entirely due to their distance from the city but to a local accumulation of sulfur compounds.

31171 **APTIC NO. 52625**

Buchan, Roy McKinney

ATMOSPHERIC DISPERSION OF PARTICULATE EMISSIONS FROM AN ACTIVATED SLUDGE UNIT. *Oklahoma Univ., Norman, Dept. of Environmental Health, Thesis (Ph.D.). Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 71p. 25 refs.*

Emission rates and atmospheric dispersion patterns of particulates downwind from an activated sludge unit were studied to determine the contribution of the plant to air pollution with respect to possible health significance. The diffusion mechanism was specifically studied with respect to distance and concentration of particulates at increased distances from the plant. Emission rates were determined using a dispersion equation. The unit was generating particulates of proteinaceous composition well within the respirable range. The concentration of protein particles was greater downwind from the aeration gallery, and the median particle diameter was smaller downwind. Windy days were especially bad in respect to potential health effect and to particle transport potential. Particle concentration did not decrease significantly at a distance of 200 ft downwind, thus jeopardizing residents in the immediate area. (Author summary modified)

31172 **APTIC NO. 52907**

Chen, Yi-Hsiung, B. L. Davis, and L. R. Johnson

SIMULATED AEROSOL-CLOUD INTERACTION IN THE AGI-NAI-H2O COMPLEXING SYSTEM. *J. Rech. Atmospheriques, 6(1-3):63-77, Jan.-Sept. 1972. 23 refs.*

The phase relations of silver iodide-sodium iodide aerosols produced from a laboratory solution generator were studied in the temperature interval from 23-15 C and at vapor pressure from subsaturation to supersaturation, using an x-ray diffraction powder method. The aerosols, collected on glass filter paper, were analyzed in a controlled atmospheric chamber. A parcel model was designed to simulate the changes in AgI-NaI aerosol ice nucleating efficiency for both ground and airborne generators, using data from the controlled atmosphere experiments. Since the free AgI remaining at any time and the aerosol phase composition for a given solution are functions of temperature and water vapor pressure, the knowledge of these parameters along a typical ascent path into a cumulus cloud is important to practical cloud seeding operations. The results show that for moist environments (50% relative humidity at ground level) nucleation by AgI-NaI aerosols produced from ground generator seeding is approximately the same as that for airborne seeding from the point of view of free AgI remaining. However, airborne seeding is potentially much more effective in dry environments (20% relative humidity at ground level). For a given type of seeding activity, the aerosol nucleation efficiency is highest along the dry ascent path. (Author abstract modified)

31173 **APTIC NO. 52529**

Cramer, Owen P.

POTENTIAL TEMPERATURE ANALYSIS FOR MOUNTAINOUS TERRAIN. *J. Appl. Meteorol., 11(1):44-50, Feb. 1972. 8 refs. (Presented at the American Meteorological Society, National Meeting, Eugene, Oreg., June 15, 1969.)*

Potential temperature analysis supplies needed information that is not obtainable by other methods of graphical analysis. Terrain surface maps and large-scale cross sections are constructed by using data from weather stations, raobs, and aircraft soundings. Interpretation of the isentropes gives a fairly detailed picture of temperature, stability, and potential wind conditions at and above the surface in mountainous terrain. Applications include weather analyses for fire and pest control and studies of smoke dispersion. (Author abstract)

31174 **APTIC NO. 5276[illegible]**

Doolittle, J. B. and Gabor Vali

COMPARISONS OF SILVER CONTENT WITH FREEZING NUCLEUS CONTENT IN HAIL AND RAIN. *J. Rech Atmospheriques, 6(1-3):133-140, Jan.-Sept. 1972. 1 ref.*

A series of laboratory tests were performed to establish the relationship between silver iodide content and freezing nucleus content. A correlation exists between silver content, as determined by atomic absorption spectroscopy, and freezing nucleus content for suspensions prepared in the laboratory. The potential usefulness of this correlation is in the possibility that the convenient and rapid freezing nucleation analyses may be used to characterize the active silver iodide content of the preparation. The correlation seems to apply independently of particle size, of filtration of the sample, and within narrow limits of the type of the storage container used.

31175 **APTIC NO. 52657**

Emmanuel, Constantinos Basil

OBSERVATIONS OF HELMHOLTZ WAVES IN THE LOWER ATMOSPHERE WITH AN ACOUSTIC SOUNDER. *Colorado State Univ., Fort Collins, Dept. of Physics, Thesis (Ph.D.). Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 110p. 50 refs.*

Helmholtz waves in the lower atmosphere were studied. Acoustic probing of the lower atmosphere revealed structures that appear to be instability waves produced by wind shear at the stable interface of a temperature inversion. The acoustic sounder was operated in the monostatic, or backscatter, mode in the vicinity of a meteorological tower 152 m in height. The acoustic sounder echo returns were recorded on a facsimile receiver. Independent and concurrent measurements of the pertinent physical parameters were taken at three fixed levels, and from a carriage which transversed the entire tower height in about 11 min. The observed instability waves had the characteristic form of shearing gravitational (Helmholtz) waves. They occurred in a substream of a hydrostatically stable zone in which the Richardson number is about one-fourth and grew to peak-to-peak amplitude corresponding to the depth of the stratum in which the layer Richardson number is about one half. This was consistent with the results obtained from the Helmholtz model. Application of horizontal wind and temperature profiles to the theoretical results yielded regions of stability or instability which conformed to the experimentally observed strata. The turbulence intensity within regions occupied by the Helmholtz waves was large as compared to clear (no echo) regions. The latter represent well mixed conditions in which the rms temperature fluctuations were small or below the sounder sensitivity. Measurements of the wavelengths associated with the breaking phenomenon conformed to the theoretically predicted range of values. It was also shown that the acoustic sounder returns come from hydrostatically stable strata in which the temperature gradient is greatest. (Author abstract modified)

31176 **APTIC NO. 52553**

Evans, W. F. J. and E. J. Llewellyn

MEASUREMENTS OF MESOSPHERIC OZONE FROM OBSERVATIONS OF THE 1.27 MICRON BAND. *Radio Sci., 7(1):45-50, Jan. 1972. 3 refs. (Presented at the COSPAR Symposium on D- and E-Region Ion Chemistry, Urbana, July 6-8, 1971.)*

Measurements of ozone from rocket observations of the 1.27 micron band are reviewed. The technique of using ground-based measurements to infer altitude profiles if the 1.27 micron emission at twilight is illustrated. A comparison of altitude distributions derived from ground-based twilight observations with direct rocket measurements of the distributions demonstrated that ground-based observations provide a practical method to monitor the twilight altitude distribution of the singlet delta state of oxygen -- O2 (1delta g). These distributions can be easily converted into ozone distributions. A two-layer strucutre is present in the altitude distribution during most months of the year, but may be absent in midsummer. An observation on Jan. 16, 1971, indicated that midsummer conditions may occur during stratopheric warming. Preliminary observations indicated a strong seasonal variation of the upper ozone layer at 85 km with peak concentrations in excess of 1.3 times 10 to the 8th power/cu cm in midwinter and less than 0.3 times 10 to the 8th power/cu cm in midsummer. (Author abstract)

31177 **APTIC NO. 53342**

Everson, P. J. and D. R. Davies

EKMAN BOUNDARY LAYER INTERACTIONS IN A NUMERICAL MODEL OF THE GENERAL CIRCULATION. *Quart. J. Roy. Meteorol. Soc. (London), 98(416):412-419, April 1972. 9 refs.*

A representation of an Ekman type of boundary layer (assumed to extend from 1000 mb to 900 mb) is inserted into a two-level, quasi-geostrophic, general circulation numerical model. An approximate time-dependent analytic solution of this boundary layer is matched to the free atmosphere regime of the model through the vertical velocities produced at the grid points. By using this analytic solution the essential physical characteristic of the observed continuous increase with height of scale length of turbulence in the boundary layer is represented. By comparing time integrations of two models, only one of which contains an Ekman layer, it is shown that large-scale flow characteristics, expressed in terms of growth rate of zonal and eddy kinetic energy, are sensitively dependent on the presence of such a layer in a numerical model. (Author summary)

31178 **APTIC NO. 52648**

Ferland, Ross Edward

THE EFFECT OF CARBON DIOXIDE AND WATER VAPOR ON THE ATMOSPHERIC TEMPERATURE PROFILE. *Houston Univ., Texas, Coll. of Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 171p. 21 refs.*

A new approach was developed for the determination of the atmospheric temperature profile. Various concentrations of carbon dioxide, water vapor, and scattering particles were introduced to determine the perturbing effect on the temperature distribution in the atmosphere. The solution was calculated using a combination of the Edwards expontial wide band model equations and the Curtis-Godson transformation. The doubling of the CO2 concentration increased the ground level temperature by 1.89 C. Halving the concentration decreased it by 1.94 C. The introduction of water vapor and scattering negated the effects of CO2 completely. (Author abstract modified)

31179 **APTIC NO. 52628**

Fernald, Frederick Gordon

RUBY LIDAR MEASUREMENTS OF THE SCATTERING PROPERTIES OF PARTICULATES WITHIN THE LOWER TROPOSPHERE. *Arizona Univ., Tucson, Dept. of Atmospheric Sciences, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 119p. 28 refs.*

The problem of determining the backscattering cross sections and the extinction cross sections of atmospheric aerosols from monostatic lidar (laser radar) data was studied. An analytical solution of the lidar equation was developed to realistically consider the scattering properties of the aerosols and the molecular atmosphere individually. An extensive error analysis was also included. Lidar data collected under very clear, slightly turbid, and very dusty conditions were then analyzed. The lidar data was also supplemented with simultaneous solar radiometer measurements of the total optical depth of the atmosphere at the laser wavelength. The solution determined the vertical distribution of the extinction cross section and the backscattering cross sections of the aerosols. (Author abstract modified)

31180 **APTIC NO. 52808**

Gagin, A.

THE EFFECT OF SUPERSATURATION ON THE ICE CRYSTAL PRODUCTION BY NATURAL AEROSOLS. *J. Rech. Atmospheriques, 6(1-3):175-185, Jan.-Sept. 1972. 22 refs.*

The effect of relatively high supersaturations on the ice crystal production by natural aerosol particles were investigated and evaluated on an experimental basis. The uncertainties in the performance of the various ice nuclei test chambers was partially attributed to the improper control of supersaturation. Conditions may exist in natural clouds in which these effects may seriously affect the ice crystal properties of these clouds. (Author abstract modified)

31181 **APTIC NO. 52647**

Harlan, James Clifford, Jr.

HAZE EFFECTS ON INFRARED REMOTE SENSING IN THE TROPICAL NORTH ATLANTIC. *Colorado State Univ., Fort Collins, Watershed Science Dept., Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 138p. 65 refs.*

The role of atmospheric aerosol particles in the infrared radiation transfer process was studied. Two hypotheses were proposed to define the effects of the aerosols. The particulate effects were investigated using a Mie scattering computer program with an atmospheric radiation transfer program. The addition of the aerosol parameters to the radiation transfer process involving carbon dioxide, ozone, and water vapor effects produced accurate simulation of apparent sea surface temperature measured at several altitudes. Atmospheric conditions representative of typical summertime haze conditions from clear sky to dense Harmattan haze over the tropical North Atlantic were analyzed. Aerosol particle effects accounted for up to 70% of the observed attenaution in the lowest 10,000 ft of the atmosphere of surface emitted infrared radiation in the 8-14 micron wavelength region. (Author abstract modified)

31182 **APTIC NO. 52922**

Hayakawa, Morihiko and Taiki Aoyama

AIR POLLUTION PATTERN OF MAIN POLLUTANTS. *(Shuyo taikiosen busshitsu no osen patan). Text in Japanese. Nagoya-shi Kogai Kenkyushoho (Rep. Environ. Pollut. Res. Inst., City Nagoya), no. 1:19-23, Nov. 1972. 5 refs.*

Hydrogen sulfide and other odors emitted by a cellophane factory disturb residents of Nagoya; therefore, H2S, sulfur dioxide, and oxidants were continuously determined in Nagoya. Weather conditions greatly affected the pollution concentration. The pollutants had a small alteration width and small alteration frequency.

31183 **APTIC NO. 52873**

Hoffer, Thomas and John Bowen

DROPLET STUDIES IN A VERTICAL WIND TUNNEL: EVAPORATION OF DROPS IN PURE AND IN NATURALLY CONTAMINATED AIR. *J. Rech. Atmospheriques, 6(1-3):259-263, Jan.-Sept. 1972. 12 refs.*

In order to investigate the effect of pollutants on droplets it is necessary to establish a representative evaporation behavior and to delineate those substances which retard evaporation. Pure water was chosen for use as the common evaporation rate against which polluted droplets can be compared. Reasonable agreement was found with the results of Beard and Pruppacher. The evaporation behavior of pure water was not modified by some natural terpene vapors.

31184 **APTIC NO. 52872**

Kachurin, L. G. and V. I. Bekrayev

ON ATMOSPHERIC CONVECTION STIMULATING. *J. Rech. Atmospheriques, 6(1-3):301-305, Jan.-Sept. 1972. 8 refs.*

The idea of the stimulation of atmospheric convection is wide spread. The Meteotron apparatus to generate free turbulent jets of large heat and kinetic energy is used both as convective clouds generator and for mines ventilation. The success of the Meteotron utilization depends on the possibility of forecasting the jet behavior in a stratified atmosphere. (Author abstract)

31185 **APTIC NO. 53315**

Kung, E. C.

A SCHEME FOR KINEMATIC ESTIMATE OF LARGE-SCALE VERTICAL MOTION WITH AN UPPER-AIR NETWORK. *Quart. J. Roy. Meteorol. Soc. (London), 98(416):402-411, April 1972. 6 refs.*

A scheme for a kinematic estimate of the vertical p-velocity (omega) is designed under the presumption that the profiles should converge to a near zero value at the top of the atmosphere without being so required when a sensitive balance between the analysis scheme and data disposition is achieved. The scheme provides a range of 8 deg of optimization in estimating the divergence through the order of polynomial representation of the wind field, the of missing wind data, and the space smoothing of the divergence. The scheme is applied to synoptic wind observations from the upper-air network over North America, and the computed omega profiles and patterns of vertical motion field obtained appear to support the proposition. Indications are that the field of kinematic omega so computed through the depth of atmosphere will be useful in the study of large-scale atmospheric dynamics. (Author summary modified)

31186 **APTIC NO. 52875**

Lacaux, J.-P.

DETERMINATION OF SILVER IN PRECIPITATION BY FLAMELESS ATOMIC ABSORPTION DETECTOR. *(Dosage de l argent dans les precipitations par spectrometrie d absorption atomique sans flamme). Text in French. J. Rech. Atmospheriques, 6(1-3):329-333, Jan.-Sept. 1972. 3 refs.*

Flameless atomic absorption spectrometry is proposed as a new technique for detecting silver in precipitation. The analytical process and calibration are determined for silver aqueous solutions. Advantages of the new technique are discussed, including: the easy working up which provides for a real-time data analysis, the detection limit (0.1 ppb) without a pretreatment of the rain sample, and the small sampling volume required for analysis. It is possible to study the small variations of silver content in precipitation, or to analyze samples as small as hailstone layers.

31187 **APTIC NO. 52645**

Li, Ta-Yung

DIURNAL VARIATION OF THE COEFFICIENT OF TURBULENT DIFFUSION THROUGH THE USE OF RADON AS A TRACER. *Drexel Univ., Philadelphia, Pa., Dept. of Physics, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 130p. 27 refs.*

The characteristics of the diurnal and height variations of radon concentration were investigated to study the variations of the turbulent diffusion coefficient. The effect of the existence of the ocean on the distribution of radon concentration in the lower atmosphere was also studied. The meteorological variables correlated with radon transfer included temperature, wind speed, stability, and lateral sheer turbulent intensity. The theoretical calculations and analytical results are presented. (Author abstract modified)

31188 **APTIC NO. 52631**

MacCracken, M. C., T. V. Crawford, K. R. Peterson, and J. B. Knox

DEVELOPMENT OF A MULTI-BOX AIR POLLUTION MODEL AND INITIAL VERIFICATION FOR THE SAN FRANCISCO BAY AREA. *Preprint, American Meteorological Society, Boston, Mass., 97p., 1972. 48 refs. (Presented at the American Meteorological Society, Annual Meeting, New Orleans, La., Jan. 10-13, 1972.)*

NTIS: UCRL-73348

A multi-box air pollution model is used in conjunction with a meteorological data model which takes as input time-dependent observed meteorological data (i.e., data relatively sparse in space and time) and outputs mass-consistent, time-varying inversion height and horizontal wind fields. The multi-box model uses these meteorological data and a given time-varying array of pollutant sources to determine the surface pollutant concentration throughout an entire region. Since the mathematics of the model do not depend on plume superposition, the photochemistry and hydrodynamics can be done simultaneously for the entire region. Because the model does not require extensive new monitoring efforts, it should be useful to air pollution districts which must develop future land use plans. The model was tested with data from the San Francisco Bay area. Model simulation of time and space-dependent carbon monoxide concentrations over 48 hours showed very good agreement with data from two of three major urban centers. The causes of the one discrepancy are under investigation. A second verification test was made with fluorescent particle release data for the Bay area. The patterns developed by the model were consistent the patterns based on observed data. Agreement was considerably better away from a point source than close to it, indicating that on a regional basis the model can also handle point sources.

31189 **APTIC NO. 52736**

Mery, P. and R. Deniau

METHODS FOR ESTIMATING POLLUTANT DISPERSION DOWNSTREAM FROM INDUSTRIAL STACKS. *(Les moyens d estimation de la dispersion des polluants a l aval des cheminees industrielles). Text in French. E.D.F. -Bull. Dir. Etud. Rech.-Ser. A, Nucl., Hydraul., Therm., no. 3:5-64, 1972. 64 refs.*

Factors determining the dispersion of pollutants discharged from stacks, as well as formulae and research approaches for the estimation of the pollution caused by industrial stacks are reviewed. Stack diameter, rate of discharge, wind speed, density difference between the pollutant discharged and the ambient air, stack height, vertical speed distribution of the air, vertical temperature gradient, and orographic conditions are among the factors determining the dispersion of the discharged pollutants. The formulae by Bosanquet and Pearson, Sutton, Calder, and Pasquill, for the determination of the diffusion of smoke plumes are presented. The Sutton formula is applicable to isolated stacks with known and continuous emission and relatively smooth surface. Long-term micrometeorological and aerological measurements in situ, requiring systematic measurements of the temperature and velocity distributions and of the ground level concentrations, mathematical models, such as the procedure applied to the standardization of stack heights in the USSR, as well as hydraulic and aerodynamic models, offering very good analogy with atmospheric flow processes, are suitable for the high-precision determination of pollutant concentrations in regions around isolated stacks.

31190 **APTIC NO. 53309**

Moses, Harry, Delbert N. Eggenberger, Steven L. Halverson, and Willaim W. Managan

METHOD FOR MEASURING THE HEIGHT OF ATMOSPHERIC AEROSOL AIR. *(Atomic Energy Commission, Washington, D. C.) U. S. Pat. 3,702,565. 10p., Nov. 14, 1972. 2 refs. (Appl. Sept. 21, 1970, 9 claims).*

A method of measuring the depth of the aerosol-contaminated layers of air (aerosol layer) is presented. Measurements are made of solar radiation at vertically displaced positions and the height of the aerosol layer calculated from the measurements. The measurements can be made by two displaced instruments at two zenith distances, by two pairs of vertically displaced instruments with one instrument of each pair receiving radiation of a first wavelength and the other instrument of each pair receiving radiation of a second wavelength or by two vertically displaced instruments with a third instrument positioned centrally between them. The height of aerosol layers separated by clear layers can also be determined. Measurement of the aerosol layer with this method is instantaneous, can be accomplished from the ground or near ground level, and does not require physical access to the top of the aerosol layer. (Author abstract modified)

31191 **APTIC NO. 53074**

Nicolet, M. and W. Peetermans

THE PRODUCTION OF NITRIC OXIDE IN THE STRATOSPHERE BY OXIDATION OF NITROUS OXIDE. *Ann. Geophys., 28(4):751-761, Oct.-Dec. 1972. 67 refs.*

The reaction of the electronically excited oxygen atom O(1D) with nitrous oxide is a natural source of nitric oxide in the stratosphere and may lead to production of .5-1.5 times 10 to the 8th power NO molecules/sq cm/sec. The predictability of a reliable estimate of NO production in the stratosphere depends strongly on the exact determination of the variable flux from the troposphere of nitrous oxide molecules; of the order of .5-1.5 times 10 to the 9th molecules/sq cm/sec. In situ sources of N2O seem to be negligible and the introduction of nitrogen oxides by upward transport from the troposphere and of NO by downward transport from the mesosphere requires adequate conditions in the tropopause and stratopause, respectively. An assumed operation of 500 supersonic transport aircraft in the stratosphere would lead to an artificial emission of NO molecules of the same order of magnitude as the natural production from N2O. (Author abstract modified)

31192 **APTIC NO. 53026**

Pilie, R., W. Eadie, E. Mack, C. Rogers, and W. Kocmond

PROJECT FOG DROPS, PART I: INVESTIGATIONS OF WARM FOG PROPERTIES. *Cornell Aeronautical Lab. Inc., Buffalo, N. Y., National Aeronautics and Space Administration Contract NASW-2126, RM-3005-M-5, Code 126-61-13-01-10, NASA CR-2078, 150p., Aug. 1972. 39 refs.*
NTIS: N72-30554

A detailed study was made of the micrometeorological and microphysical characteristics of eleven valley fogs occurring near Elmira, New York. Observations were made of temperature, dew point, wind speed and direction, dew deposition, vertical wind velocity, and net radiative flux. In fog, visibility was continuously recorded and periodic measurements were made of liquid water content and drop-size distribution. The observations were initiated in late evening and continued until the time of fog dissipation. The vertical distribution of temperature in the lowest 300 m and cloud nucleus concentrations at several heights were measured from an aircraft before fog formation. The behavior of these parameters before and during fog are discussed. A numerical model was developed to investigate the life cycle of radiation fogs. In the atmosphere, the model predicts the temporal evolution of the vertical distributions of temperature, water vapor, and liquid water as determined by the turbulent transfer of heat and moisture. The model includes the nocturnal cooling of the earth s surface, dew formation, fog drop sedimentation, and the absorption of infrared radiation by fog. The capabilities and limitations of the model are examined. (Author abstract)

31193 **APTIC NO. 52566**

Rangarajan, S.

WAVELENGTH EXPONENT FOR HAZE SCATTERING IN THE TROPICS AS DETERMINED BY PHOTOELECTRIC PHOTOMETERS. *Tellus (Uppsala), 24(1):56-64, 1972. 9 refs.*

Sun photometers using narrow-band interference filters, photoelectric sensors and solid-state operational amplifiers were constructed, and intensive measurements of the haze extinction coefficients at 0.40 and 0.60 micron wavelengths were made at Poona, India (latitude 18 deg N) over a 1-year period. The wavelength exponent for the haze scattering as calculated from 520 pairs of simultaneous observations showed a median value of 0.5 and a mode of about 0.8. These were substantially lower than corresponding values found in the case of middle latitude stations. In general, the exponent was correlated positively with the turbidity itself in the case of wet haze, and under conditions of very clear and dry air it assumed near zero values. A marked diurnal variation in the value of the exponent occurred during the regimes of tropical continental air. The consequences of the prevailing lower values of the wavelength coefficient in relation to determination of the Angstrom turbidity coefficient in the tropics are briefly discussed. (Author abstract modified)

31194 **APTIC NO. 53106**

Raynor, Gilbert S., Eugene C. Ogden, and Janet V. Hayes

DISPERSION AND DEPOSITION OF CORN POLLEN FROM EXPERIMENTAL SOURCES. *Agron. J., vol. 64:420-427, July/Aug. 1972. 18 refs.*

The atmospheric dispersion and subsequent deposition of corn pollen emitted from plants in two 18-meter diameter plots were studied to compare the spread of this large pollen to that of smaller pollens (ragweed and timothy). The data were analyzed in terms of current meteorological dispersion theory. They indicate that corn pollen is not transported as far by the wind as smaller pollens, it does not disperse as widely in either the horizontal or the vertical direction, and it settles to earth more quickly, much of it within the source itself. The dispersion of corn pollen is influenced by its large size and rapid settling rate, and the rate of settling opposes the rate of upward dispersion so that the height of the pollen plume does not increase continuously with downwind distance. Total deposition within the source plot is greater than that outside. The velocity of deposition at 32 m from the source averages about 33 cm/sec. Plume behavior, the effect of crosswind, and the velocity of deposition are mentioned.

31195 **APTIC NO. 52563**

Roenicke, Gerhard

INVESTIGATION OF LIQUIDS BY X-RAY FLUORESCENCE ANALYSIS. *(Fluessigkeitsuntersuchung mit der Roentgen-Fluoreszenzanalyse). Text in German. Siemens Analysentechnische Mitteilungen 12, 4p., June 1972. 7 refs.*

An improved preparative technique for the qualitative and quantitative determination in rainwater of sulfur, phosphorus, calcium, chlorine, potassium, and lead by X-ray fluorescence analysis, as applied to air pollution and pollutant washout studies, is described. The rainwater sample is reduced by evaporation in exsiccator in pure-aluminum scale with a depth of 4 mm and a diameter of 34 mm. Such pure-aluminum scales have sufficiently low blenk values for S, P, Ca, Cl, and K. The scale with the evaporation residue is placed in the sample holder for the determination of the intensity of the desired line against corresponding calibration curves.

31196 **APTIC NO. 53011**

Schaefer, Vincent J.

SOME RELATIONSHIPS TO WEATHER MODIFICATION OF FINE PARTICLES IN THE ATMOSPHERE. *J. Weather Mod., 4(1):204-210, April 1972. 9 refs.*

The relationship of fine particles in the atmosphere to weather modification is discussed. The sources of particles, including engine exhausts, are reviewed, and their effect on moisture and plume behavior considered. Factors controlling air quality, especially the weight of airborne material, the chemical and physical composition of suspended material, and the number of suspended particles are described. The importance of particle sampling and measurements on the local and global scales is emphasized.

31197 **APTIC NO. 53537**

Schmidt, F. H.

THE DISPERSION OF ORGANIC MATTER IN THE ATMOSPHERE. *(De verspreiding van organisch materiaal in de atmosfeer). Text in Dutch. Netherlands Aerobiology Contact Group, 8p., 1972. 8 refs. (Presented at the Aerobiology Symposium, Wageningen, Netherlands, Jan. 27, 1972.)*

Factors determining the dispersion of organic particles in the atmosphere are surveyed, and a few studies on the propagation and dispersion of pollen in the atmosphere are described. The dispersion of organic particles such as pollen grains in the atmosphere is determined by such factors such as wind speed and direction, rate of settling, the height of the emission source, turbulence, precipitation, the catch efficiency of raindrops, and the movement of fronts. Hewson s studies on the atmospheric propagation and dispersion of ragweed pollen demonstrated that the rate of pollen deposition increase with the distance from the emission source, the exponent being 2.7.

31198 **APTIC NO. 53318**

Turner, J. S.

ON THE ENERGY DEFICIENCY IN SELF-PRESERVING CONVECTIVE FLOWS. *J. Fluid Mech. (Cambridge), 53(part 2):217-226, May 1972. 19 refs.*

The energy ratio of the discrepancy between the work done by buoyancy forces and the kinetic energy of mean motion for a wide variety of forms of buoyant elements and environmental stabilities is set forth in conncetion with similarity solutions used to describe convective plumes or thermals. Results are given for axisymmetric plumes, line plumes, plumes from point sources Hills spherical vortex, small core, and constant core over a variety of interpretations such as neutral environment, constant velocity, free convection, constant density difference, and saturated environment. The findings indicate that the efficiency with which convective motions convert potential to kinetic energy on the largest scale does indeed depend on the form of the motion and on the velocity profile. The results also suggest that there will be a different relation between the mean flow and turbulent kinetic energies for each similarity condition, and this difference can be important in the assessment of various entrainment models of mixing into the convective elements.

31199 **APTIC NO. 52819**

Woodcock, Alfred H. and Robert A. Duce

THE LARGE SALT NUCLEI HYPOTHESIS OF RAINDROP GROWTH IN HAWAII: FURTHER MEASUREMENTS AND DISCUSSION. *J. Rech. Atmospheriques, 6(1-3):639-649, Jan.-Sept. 1972. 39 refs.*

Observations of salt particles, cloud droplets, and raindrops in the atmosphere and in the orographic clouds of Hawaii are examined as a further test of the hypothesis that only the cloud droplets which have grown on large salt particles from raindrops. Previous comparisons of salt particle and raindrop I/Cl values had strongly supported the idea. The numbers of the large salt particles, the numbers and sizes of cloud droplets, and the numbers, sizes, and chlorinities of the raindrops in Hawaii supported the large particle hypothesis of raindrop growth. (Author abstract)

1971

31200 **APTIC NO. 53532**

Descamps, Valentine J.

INTERIM INSTRUCTIONS FOR THE USE OF THE NATIONAL METEOROLOGICAL CENTER AIR POLLUTION POTENTIAL (APP) PRODUCTS. *Air Force Air Weather Service, Washington, D. C., Environmental Technical Applications Center, USAF-ETAC-TN-71-1. 25p., Feb. 1971. 6 refs.*

NTIS: AD 718966

Instructions are presented to aid the detachment forecaster in interpreting and tailoring the Air Pollution Potential (APP) facsimile charts and teletype messages produced by the National Meteorological Center (NMC) for his mission requirements. These instructions will be revised when required to reflect accumulated field experience. General information regarding the NMC information system and its application to local situations is presented. Pollutant, air pollution potential product, pollution potential, dispersion, dispersion criteria, stagnation area, and high air pollution potential are discussed. Obtaining the meteorological data that constitute these criteria is mentioned. Application of conventional facsimile products to APP forecasting is also discussed. Appendices provide information relating to: pollution terminology; locations of operating Environmental Meteorological Support Units (ESMUs); NMC detachments with FOFAX; the integration of EMSU products into an alert system in New York City; and a suggested air pollution forecast worksheet.

31201 **APTIC NO. 52641**

Donaldson, Coleman duP. and Glenn R. Hilst

COMPUTING DISPERSAL OF ATMOSPHERIC POLLUTANTS NEAR AIRPORTS. *Aeronautical Research Associates of Princeton, Inc., N. J., National Aeronautics and Space Administration Contract NAS1-10192, NASA CR-111962, ARAP Rept. 162, 34p., July 1971. 6 refs.*

NTIS: N71-36720

The application of the methods of invariant modeling of turbulent shear flows and atmospheric dispersion of conservative pollutants to the problem of air pollution in the vicinity of airports was studied. With only minimum information input (mean wind and temperature profiles), the invariant modeling technique predicted the structure of atmospheric turbulence and associated fluxes of atmospheric properties, e.g., heat, momentum, and gaseous pollutant matter, within very useful limits of accuracy. (Author summary modified)

31202 **APTIC NO. 52627**

Franz, James John

DIURNAL VARIATIONS OF TURBULENCE WITHIN THE PLANETARY BOUNDARY LAYER. *Florida Univ., Gainesville, Dept. of Environmental Sciences, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1971, 311p. 104 refs.*

The diurnal variations of turbulence within the planetary boundary layer (mixing height) and methods for measuring them were investigated. The output signal of an rms voltmeter set at a 10-second time constant and excited by an accelerometer as installed in an aircraft responded to changes in atmospheric turbulence in a manner similar to measurements by traditional meteorological instruments. Relative turbulence was measured by this method and was proportional to the rms of the output signal from the accelerometer mounted near the center of gravity of the aircraft. The turbulent mixing height as determined with temperature and turbulence soundings was characterized by this aircraft technique. Data from 101 aircraft soundings and recordings of continuous ground meteorological variables were used. The rate of turbulent dissipation with altitude decreased with increasing mixing height and decreased in the late afternoon with diminishing surface heating. The average turbulence near the ground correspondingly decreased from the time of maximum surface heating to the late afternoon. The turbulence measured by the aircraft was compared to near-ground measurements of net radiation, solar radiation, sky opaqueness, cloudiness, wind speed, air temperature, gustiness, vertical turbulence, and vertical temperature lapse rate. Of these, the total turbulence through the mixing layer linearly correlated the best with hourly readings of solar or net radiation, with a correlation coefficient of 0.70 and 0.71, respectively. A low turbulence level common in stable conditions was used as the criteria in determining the turbulent mixing height through the aircraft accelerometer technique. Solar radiation had the lowest standard error of estimating the average turbulent mixing height with values of 408 M, 265 M, and 65 M for hourly, averaged hourly, and averaged daily readings, respectively. (Author abstract modified)

31203 **APTIC NO. 52581**

Greenway, A. Roger and David S. Lydon

DETERMINATION OF MAXIMUM EMISSION RATES TO MEET AIR QUALITY STANDARDS. *Air Force Air Weather Service, Washington, D. C., Environmental Technical Applications Center, TR-71-9, 23p., Aug. 1971. 5 refs.*

NTIS, DDC: AD 733505

The effect of various meteorological and operating parameters on stack emission rates was investigated with respect to methods for determining stack emissions and ground level dispersion. The various parameters included emission rate, stack height, stability and turbulence factors, wind speed and direction net solar radiation, and cloud cover. The maximum allowable stack emissions were calculated for various Air Force bases.

31204 **APTIC NO. 52985**

Mahoney, J. R.

MODELS FOR PREDICTION OF AIR POLLUTION. *Organisation for Economic Co-Operation and Development, Paris (France), Environment Directorate, 81673, 84p, April 15, 1971. 39 refs.*

Existing air pollution prediction models provide useful estimates of urban air pollution levels and distributions. These models have applications in several areas, including land use planning, evaluation of air pollution control strategies, short period (e.g., daily) predictions, and air quality monitoring. Current models do not take into account transformations of pollutants, and the maximum geographic region that can be treated by the models is a few tens of kilometers in dimension. The greatest precision (accuracy of plus or minus 25%) results when concentration estimates are averaged over a long period and the whole region. Such precision is not possible in the case of short period, single point predictions, for which an order of magnitude error may occur. However, model estimates of single point concentrations likely to be exceeded only a few days each year can be expected to be accurate within a factor of two. The prime requirement for improvement of these models is a better understanding and representation of loss processes (deposition and washout) and transformations (chemical, photochemical, and physical). Attempts to achieve more realistic estimates of plume characteristics from meteorological measurements will result in only marginal improvement. In general, elaborations of existing models should be subject to the most critical scrutiny as regards the expected benefits. In every case, authorities initiating modeling programs should seek the advice of an experienced meteorologist, and should be prepared to support the effort required to ensure adequate operating experience. Further, agencies should use the models as much as possible in establishing comprehensive monitoring programs. (Author summary modified)

31205 **APTIC NO. 52642**

Meroney, R. N. and B. T. Yang

WIND-TUNNEL STUDY ON GASEOUS MIXING DUE TO VARIOUS STACK HEIGHTS AND INJECTION RATES ABOVE AN ISOLATED STRUCUTRE. *Colorado State Univ., Fort Collins, Fluid Dynamics and Diffusion Lab., Atomic Energy Commission Contract AT (11-1)-2053, AEC Rept. C00-2053-6, CER71-72RNM-BTY16, 48p., Nov. 1971. 15 refs.*

NTIS: C0020536

Gaseous dispersion about an isolated building structure was studied. To estimate the maximum ground concentration distribution, the conventional formula was compared with wind tunnel results. Different stack heights were monitored by smoke visualization and quantitative concentration measurements. Moderate increases in stack height and exhaust velocity improved dilution before ground interception by tenfold over the levels expected for complete entrainment. As the stack height increased, the effect of building entrainment decreased. Building orientation aggravated entrainment even for a simple cubical structure. (Author abstract modified)

31206 **APTIC NO. 53390**

Ruppersberg, Gerhard H.

THE CHANGES OF THE SCATTERING COEFFICIENT OF MARITIME HAZE WITH HUMIDITY. *(Die Anderung des maritimen Dunst-Streukoeffizienten mit der relativen Feuchte). Text in German. Meteor Forschungsergeb., Reihe B, 4(6):37-60, June 1971. 56 refs.*

The equilibrium radii of maritime aerosol particles were calculated for the purpose of describing quantitatively the changes in the standard visibility or in the scattering coefficient which result from changes in the humidity. No assumptions were made regarding particular particle size distributions, and changes in the density and in the refractive index of the aerosol droplets and insoluble ingredients were admitted. The results were illustrated with an aqueous sodium chloride-aerosol and were compared with the measurements of other authors. A close mathematical relationship existed between the wavelength dependence of the scattering coefficeint for haze and its changes with humidity. Applied to the measurements from the Atlantic Meteor-Expedition of 1965, there follows a deformation of the oceanic particle size distributions in the range below 1 micron radius. Characteristic changes in the size distributions of any aerosol result above 98% humidity; this agrees with frequently observed changes in time of the wavelength dependence of the atmospheric scattering coefficient. (Author summary)

31207 **APTIC NO. 53387**

Simmons, W. R., J. W. Wescott, and F. F. Hall, Jr.

ACOUSTIC ECHO SOUNDING AS RELATED TO AIR POLLUTION IN URBAN ENVIRONMENTS. *National Oceanic and Atmospheric Administration, Boulder, Colo., Environmental Research Labs., NOAA-TR-ERL 216-WPL-17, 80p., May 1971. 30 refs.*

GPO

The feasibility of operating an acoustic echo sounder in an urban or industrial environment, without serious degradation in performance and without contributing to noise pollution was confirmed. Anechoic absorbers placed about the acoustic antenna are the key to improving the sounder performance. Optimum operating frequencies are between 1 and 2 kHz. The design and operation of the all solid state circuitry are described. The sounder can be used to detect temperature inversions, thermal structure variability, and turbulence in the atmospheric boundary layer. The sounder is feasible for use as a routine tool for the air quality meteorologist. (Author abstract modified)

31208 **APTIC NO. 53411**

Somers, E. V.

DISPERSION OF POLLUTANTS EMITTED INTO THE ATMOSPHERE. *In: Air Pollution Control Part I. W. Strauss, (ed.), New York, Wiley-Interscience, 1971, p. 1-33. 55 refs.*

Design considerations are presented for the dispersion of pollutants emitted into the atmosphere. Most important in the analysis of dispersion of pollutants is the free-convective contribution, since the diurnal heating-and-cooling cycle associated with sun markedly affects the near-ground layer of air within which most pollutants are emitted and dispersed. Most pollutants are emitted from stacks above ground so that the ground-level expression must be modified to account for this. Accurate description to include ground reflection is easily obtained by use of the method of images. Another condition of interest is the inversion trap in which an inversion layer present at some height above the ground serves as a reflecting boundary such that pollution emissions into the turbulent layer between the ground and inversion layer are pocketed there. Dispersion of particulates emitted from a stack differs from that of pollutant gases contained in the plume, in that the particles settle toward the earth under gravity and generally upon reaching the earth s surface are not re-entrained in the atmosphere by wind. The design of plant effluents today must also account for possible formation and elimination of fog plumes that arise from cooling towers and industrial, utility, and chemical plants. Dispersion of water vapor can be handled in the same design way as the dispersion of gaseous pollutants. Evaluation of spreading coefficients has been the subject of much field experimentation but is not yet sufficient to establish undebatably accurate estimates. The estimate of dispersion of pollutants from stacks includes consideration of many effects including: local and average meteorological conditions, the thermal and momentum rises of the plume from the stack, topography and nearby buildings, and multiple stacks close to each other.

31209 **APTIC NO. 52971**

Tsunogai, Shizuo

AMMONIA IN THE OCEANIC ATMOSPHERE AND THE CYCLE OF NITROGEN COMPOUNDS THROUGH THE ATMOSPHERE AND THE HYDROSPHERE. *Geochem. J., 5(2):57-67, 1971. 27 refs.*

The concentration of ammonia in the maritime atmosphere was determined and compared with that over land. The total ammonia concentration in the maritime air averaged 50 ngat/cu m (STP); the concentration was greater in the air nearer land and much greater in the air over land. The proportion of aerosol ammonia to total ammonia in the maritime air averaged 30% in the North Pacific and 80% in the South Pacific. These findings suggest that most of the ammonia in the oceanic air is of continental origin. The amount of combined nitrogen transported from the land to the ocean was estimated from its concentration in rain water to be 150 billion gatN/y. The large supply of nitrogen from the land appears to be balanced by the denitrification in the ocean. The denitrification mechanism may involve the reduction of nitrates in sea water containing little nitrogen or the nitrate respiratory process occurring during the decomposition of organic matter in oxygenated water. (Author abstract modified)

31210 **APTIC NO. 52582**

Tucker, G. L., H. E. Malone, and R. W. Smith

ATMOSPHERIC DIFFUSION OF BERYLLIUM (PROJECT ADOBE). (FINAL REPORT). *Air Force Systems Command, Edwards Air Force Base, Calif., Air Force Rocket Propulsion Lab., AFRPL-TR-70-65-VOL. I, 113p., July 1971. 18 refs.*

NTIS, DDC: AD 726999

Exhaust cloud diffusion from solid rocket motors was studied to correlate the diffusion of rocket motor exhaust clouds with measurable meteorological variables under both stable and unstable atmospheric conditions. Meteorological data on wind speed and direction and temperature lapse rate and data on beryllium integrated concentration as determined by chemical analysis of exhaust were collected in a series of field studies, reduced, and used in regression analyses. A series of diffusion equations was developed for hot quasi-instantaneous releases. (Author summary modified)

31211 **APTIC NO. 53317**

Twitty, Jerold T. and James A. Weinman

RADIATIVE PROPERTIES OF CARBONACEOUS AEROSOLS. *J. Appl. Meteorol., 10(4):725-731, Aug. 1971. 15 refs.*

The complex index of refraction for various carbonaceous materials is presented for wavelengths from 0.3 micron to 20 micron. An ensemble of spherical carbon dust particles represented by two size distributions typical of urban aerosols is utilized in conjunction with Mie theory to determine the extinction coefficient, the albedo for single scattering, the asymmetry factor (cosine theta), the average phase function, and the polarization for wavelengths of 0.3 micron to 15 micron. The results indicate that the radiative effects of carbonaceous aerosols may be important during prolonged periods of major pollution. Indexes of refraction for graphite, coals, and soots are mentioned. (Author abstract modified)

31212 **APTIC NO. 53531**

Wenger, Karl F., Carl E. Ostrom, Philip R. Larson, and Thomas D. Rudolph

POTENTIAL EFFECTS OF GLOBAL ATMOSPHERIC CONDITIONS ON FOREST ECOSYSTEMS. *In: Man s Impact on Terrestrial and Oceanic Ecosystems. W. H. Matthews (ed.), Cambridge, Mass., MIT Press, 1971, p. 192-202. 9 refs.*

It is estimated that the carbon dioxide content of the atmosphere will increase by 25% by the year 2000 and by 50% by the year 2050. This increase would increase the productivity but probably would not affect the species composition of forest ecosystems. Increases in CO2 concentration, amounts of particulate matter, water vapor, the concentrations of ozone and other gaseous pollutants, and the addition of waste heat to the atmosphere will affect the intensity of incoming solar radiation, the temperature; and the rainfall. A decrease in the intensity of sunlight would be accompanied by a related decrease in the productivity of the earth s forests. A rise in global mean temperature would displace tree ranges poleward, widen the tropical zone, increase productivity on a long term basis, and decrease productivity on a short term basis. A drop in global mean temperature would tend to reduce productivity and increase susceptibility to insects and diseases. An increase in precipitation would increase productivity, expand forested areas into drier regions, and change the species composition of the forests; a decrease in precipitation would have the opposite effects. When all the probable effects of these climatic changes are taken into consideration, it appears that any appreciable permanent change in worldwide climate is likely to reduce productivity for a long time. Ecosystem-climate analogies could be used to reliably predict the vegetational changes likely to occur under changed climatic conditions. Although at high pollution levels all forest species would be adversely affected the smaller plants are relatively more immune to these effects than the trees. Forest ecosystems in relatively unpolluted habitats could be monitored to determine population densities and productivity; the data obtained could be compared with that obtained from forests in polluted habitats to determine the effects of the pollution.

1970

31213 **APTIC NO. 52963**

Duntley, Seibert Q.

INTERACTION OF OPTICAL ENERGY WITH THE ATMOSPHERE. *Preprint, American Inst. of Aeronautics and Astronautics, New York, Technical Information Service, 8p., 1970. 6 refs. (Presented at the American Institute of Aeronautics and Astronautics, Earth Resources Observations and Information Systems Meeting, Annapolis, Md., March 2-4, 1970, paper 70-288.)*

The principles governing the atmospheric limitations on remote sensors which use visible light provided by the sun are summarized. From the standpoint of remote sensing, the only significant interaction of visible light with the atmosphere is scattering. Depending on the sizes of the water droplets in the atmosphere, this scattering can involve simple reflection and/or complex Mie scattering. In that the atmosphere is always composed of a complex structure of layers which differ in their scattering properties, scattering by real atmospheres cannot as yet be determined. Although molecular scattering by the constituent atmospheric gases has been observed at very high altitudes, the forward scattering produced by Mie particles has always been concomitantly observed. Earth atmospheres usually or often also contain the following: ground haze produced by evaporation from the earth s surface; minor haze layers at higher altitudes; and virtual horizontal uniformity. Atmospheric limitations on remote sensing include: path radiance, which results form the upward scattering of sunlight and skylight and veils the ground image by reducing its apparent contrast; and beam transmittance, which refers to that fraction of the image forming light which reaches the remote sensor without having experienced disruptive scattering. Speculative numerical values for path radiance and beam transmittance can be generated by computer programs. Such computer studies may be immediately useful in the design of remote sensing systems because they can provide parametric information. Measured data on the path radiance and beam transmittance of real atmospheres can be collected by: photographic aircraft over flying prepared and monitored test panels on the ground; instrumented aircraft equipped with photoelectric recording equipment; and ground based instruments which measure apparent radiance at the center of the solar disc.

31214 **APTIC NO. 52590**

Harrison, Halstead

STRATOSPHERIC OZONE WITH ADDED WATER VAPOR: INFLUENCE OF HIGH-ALTITUDE AIRCRAFT. *Science, vol. 170:734-736, Nov. 13, 1970. 15 refs.*

Simple, steady-state models for ozone photochemistry, radiative heat balance, and eddy diffusive mass transport were combined to estimate water-induced changes in the stratospheric ozone concentrations and temperatures, the integrated ozone column, the solar power transmitted to the surface of the earth, and the surface temperature. The changes were computed parametrically for mixing fractions of water vapor between 0.000003 and 0.0000065. Calculated to account for added water from the exhausts of projected fleets of stratospheric aircraft, the estimated changes included a 3.8% decrease of the ozone column, an 0.07% increase in transmitted solar power, and an 0.04 K increases in the surface temperature of the Northern Hemisphere. Due to a cancellation of terms, temperatures in the lower stratosphere remained essentially unchanged. (Author abstract modified)

31215 **APTIC NO. 53135**

Hovis, W. A.

INTERACTION OF INFRARED ENERGY WITH THE EARTH S ATMOSPHERE. *Preprint, American Inst. Aeronautics and Astronautics, New York, 7p., 1970. 3 refs. (Presented at the American Institute of Aeronautics and Astronautics, Earth Resources Observations and Information Systems Meeting, Annapolis, Md., March 2-4, 1970, Paper 70-289.)*

The atmosphere interacts with infrared energy principally by selective absorption of energy by carbon dioxide, water vapor, and other gases. Other absorptions occur due to clouds and other particulate matter such as aerosols or dust. These absorptions vary in intensity with both wavelength and absorber concentration and introduce inaccuracies into measurements of solar energy reflected from earth and thermal energy emitted from earth. Measurements made with downward looking instruments from aircraft simulate measurements from spacecraft and indicate optimum spectral regions for remote sensing. Determination of surface solar energy reflectance is accomplished at 0.7-1.1, 1.2-1.3, 1.5-1.75, and 2.0-2.4 micron. At night, the 3.2-4.2 micron interval can be used for remote sensing of temperature. Remote sensing of thermal radiation emitted from earth s surface must be carried out in the 8-14 micron interval, i.e., at wavelengths not obscured by water vapor, ozone, or carbon dioxide. Techniques have been developed to invert the radiation from narrow intervals within the 15 micron CO2 band to produce a vertical temperature profile of the atmosphere. Nimbus IV will test methods of using the radiance of the 6.3 micron water vapor band to determine water vapor concentration and profile. With a known temperature and vapor profile, errors introduced into remote sensing of the surface by water vapor absorption can be reduced. No method exists for remotely sensing dust to determine its quantity or vertical distribution. Dust, however, is of far less consequence than gaseous absorption. (Author abstract modified)

31216 **APTIC NO. 53529**

Lundqvist, Jan and Karin Bengtsson

THE RED SNOW - A METEOROLOGICAL AND POLLEN-ANALYTICAL STUDY OF LONGTRANSPORTED MATERIAL FROM SNOWFALLS IN SWEDEN. *Geol. Foeren. Stockholm Foerh., vol. 29:288-301, 1970. 9 refs.*

On Jan. 7, 1969, there was an intense precipitation of red colored snow in eastern Sweden. On Feb. 18, 1969, there was a precipitation of greyish brown snow in the same general region. Samples of the two snows contained relatively large amounts of foreign materials consisting of aggregates of mineral material (probably from the upper parts of the soil), and several species of pollen, spores, and fragments of diatoms. The flora in these samples differed significantly from the local flora and appeared to be of a variety which would be expected from the vegetation of the steppe, semi-arid, and arid regions of southern Russia. In this region, violent storms prevailed for considerable periods during and before the snowfall in Sweden. These storms caused a great deal of soil erosion in the region north of the Black Sea, and the turbulent air was able to keep the eroded soil suspended and transport it without significant dispersion toward Scandinavia. It is estimated that the necessary conditions for the transport of pollen and dust from the regions in southeastern Europe occur twice a year on the average; the general conditions were even more favorable for the transportation of material of this type in late glacial times. It is possible that this transportation might have a noticeable effect upon pollen analytical research (i.e., it might account for the occurrences of foreign pollen types in pollen diagrams). It also has application to other questions, such as the invasion of new species of microorganisms into barren areas.

31217 **APTIC NO. 52577**

Niemann, Brand L., Margaret C. Day, and Paul B. MacCready, Jr.

PARTICULATE EMISSIONS, PLUME RISE, AND DIFFUSION FROM A TALL STACK. VOLUME 1. TECHNICAL REPORT. (FINAL REPORT). *Meteorology Research, Inc., Altadena, Calif., National Air Pollution Control Administration Contract CPA 22-69-20, Rept. MRI-69-FR-890, APTD-0852, 140p., Jan. 1970. 28 refs.*

NTIS: PB 204990

Data were collected at an electric generating plant with respect to emission exit velocity, heat emission, sulfur dioxide source strength, and fly ash quantity and composition and were correlated with measurements of temperature, stability, pressure, wind speed and direction, mixing layer depth, and relative humidity to study plume behavior and diffusion in relationship to turbulence. Vertical exchange coefficients were derived to explain the vertical transport of the plume in final stages of development. The system was also used to monitor the decay of turbulence in the initial plume. The measurement methods and data analysis are reviewed.

31218 **APTIC NO. 53114**

Nozdryukhin, V. K.

ON THE NATURAL CONTAMINATION OF THE SNOWFIELDS IN THE VALLEY OF THE ABRAMOV GLACIER. *(O estestvennoy zagryaznennosti snezhnogo pokrova v basseyne lednika Abramova). Text in Russian. Tr. Sredneaziat. Nauch.-Issled. Gidrometeorol. Inst., 56(71):37-42, 1970.*

The dust content of the snow in the surface layer of the Abramov glacier in the USSR was determined at the end of June, July, and Aug. 1969. The mean values of the dust content at altitudes ranging from 3920 to 4510 m were 2.45, 6.37, and 10.73 g/sq m in June, July, and Aug., respectively; this increase was parallel to that of the overall dust concentrations in the glacier area due to dust drift from far-off areas and from nearby valleys. The dust content in the snow decreased with altitude, as did the in-the-air dust concentrations.

31219 **APTIC NO. 53393**

Tonna, G.

MIE EXTINCTION COEFFICIENT FOR SPHERICAL PARTICLES. *Consiglio Nuzionale della Ricerche, Rome (Italy), Istituto di Fisica dell Atmosfera, SR 30, 25p., June 1970. 9 refs.*

Tables of values for the Mie extinction coefficient of spherical particles and real refractive index are provided. Calculations were performed for the following refractive indices, size parameter range, and increments: m equals 1.33, alpha equals 0.1 (0.1) 200; m equals 1.55 and alpha equals 0.1 (0.1) 30. The lower and upper limit of alpha were chosen to span the radius range of fog droplets and condensation nuclei respectively. The program used for computations was translated for the IBM 1130 computer from an original written for the IBM 7094.

31220 **APTIC NO. 53103**

Werner, Ch.

MEASUREMENTS OF VERTICAL AEROSOL DISTRIBUTION IN THE ATMOSPHERE WITH A LIDAR-SYSTEM DURING THE ATLANTIC TRADE WIND EXPERIMENT (ATEX) ON BOARD THE W.F.S. PLANET. II. RESULTS. *(Ein Lidar- System zur Messung der vertikalen Dunstverteilung in der Atmosphaere waehrend des Atlantischen Passat Experiments (APEX) auf W.F.S. Planet. II. Messergebnisse). Text in German. Meteor Forschungsergeb., Reihe B, no. 5:62-84, Dec. 1970. 16 refs.*

During the Atlantic Trade Wind Experiment, the lidar-system was used to measure the vertical aerosol distribution to an altitude of 3.5 km and to measure the cloud base to 14 km. The haze measurements are discussed in connection with aerological measurements. A positive relationship between backscatter function and relative humidity was found. In addition, a correlation with the wind velocity existed. Measurements of standard visibility for special weather conditions are considered. Determination of the altitude of a cloud is given, together with the measurement of its radiation temperature at cloud base. (Author summary modified)

1966

31221 **APTIC NO. 52646**

Jenney, Joe Allen

AIRBORNE INVESTIGATIONS OF CLEAR AIR TURBULENCE WITH OPTICAL RADAR. *Michigan Univ., Ann Arbor, Dept. of Meteorology, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1966, 115p. 23 refs.*

Airborne experiments were conducted to explore the possibility that characteristic optical radar echoes might be correlated with clear air turbulence. A laser radar and various meteorological instruments were used to collect data on scattering from atmospheric aerosols, turbulence, temperature fluctations, and cloud conditions. Three locations of different meteorology and terrain were chosen as test sites. In each area, approximately 90% of the experiments failed to reveal either peculiar aerosol distributions or turbulence. Of the remaining 10%, roughly one-third exhibited turbulence, one-third exhibited interesting aerosol distributions, and the remaining one-third exhibited both effects concurrently. (Author summary modified)

1962

31222 **APTIC NO. 53377**

Barnum, Dale Carroll

THE INFLUENCE OF SEVERAL METEOROLOGICAL PARAMETERS ON THE SMOKINESS IN THE SAINT LOUIS AREA. *St. Louis Univ., Mo., Thesis (M.S.), 1962, 107p. 30 refs.*

The influence of wind direction and velocity, temperature, specific humidity, precipitation, and atmospheric pressure on the smokiness in the St. Louis area was investigated. Smokiness refers only to the particulate matter ins suspension; gaseous pollutants are not included. The data cover April 1, 1954 through March 31, 1958. Nearly 5000 measurements of particulate matter and the corresponding weather observations were provided by the St. Louis Smoke Commissioner. The basic unit used in the measurement of particulate matter is called coefficient of haze (coh) unit and is defined as that quantity of light scattering solids which will produce an optical density of 0.01 when measured by light transmission. Neither the occurrence nor the amount of precipitation had any significant effect on the amount of suspensoid material in the lower atmosphere. Wind direction also had little influence. Wind velocity had no effect on the variation in pollution concentration, but did correlate with the amount of pollution. The specific humidity was significantly correlated with the change in Coh amounts, but was not necessarily a causal factor. The changes in temperature had the most significant correlations with the change in Coh. Changes in pressure had little effect. The variables considered do not adequately measure those properties of the atmosphere which are conducive to the dispersion and retention of pollutants.

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1973

31223 **APTIC NO. 52755**

Annis, B. K., A. P. Malinauskas, and E. A. Mason

THEORY OF DIFFUSIOPHORESIS OF SPHERICAL AEROSOL PARTICLES AND OF DRAG IN A GAS MIXTURE. *Aerosol Sci., vol. 4:271-281, 1973. 11 refs.*

Theoretical expressions for the motion of spherical aerosol particles in a diffusing gas mixture are obtained that cover the free-molecule to the continuum regime. The theoretical model used treats the aerosol particles as one component of a multicomponent mixture. Examples are considered in detail in which the gas mixture is undergoing equal countercurrent diffusion, diffusion with one component stagnant, and equal pressure diffusion. The method also permits the calculation of the composition and pressure dependence of the drag exerted on a moving particle by a uniform gas mixture. (Author abstract modified)

31224 **APTIC NO. 52827**

Bailey, Peter L. and Edmund Bishop

REACTION OF SULPHITE IONS WITH CYANOGEN CHLORIDE. *J. Chem. Soc. Dalton Trans., no. 9:917-921, 1973. 13 refs.*

The reaction between cyanogen chloride and sulfite ions has been shown to involve the formation of a stable adduct. The formation and decomposition of this adduct were studied by kinetic analyses, from which a reaction scheme is proposed. The activation energies of both reactions were determined. The initial rate of decay of SO_4 ion in adduct formation is almost twice that of CNCl. It appears that two SO_4 ions are reacting with each CNCl molecule. Decomposition results suggest that the ratio of CNCl to SO_4 ion in the adducts is 1:1. The decrease of the second-order rate constant of the formation reaction with decrease in pH strongly indicates that the reacting sulfur species is sulfite ion.

31225 **APTIC NO. 52880**

Bevan, P. L. T. and G. R. A. Johnson

KINETICS OF OZONE FORMATION IN THE PULSE RADIOLYSIS OF OXYGEN + ETHYLENE MIXTURES. *J. Chem. Soc. Faraday Trans. 1, 69(5):922-927, 1973. 11 refs.*

Pulse radiolysis of oxygen plus ethylene mixtures was used to determine the rate constant of the reaction forming ozone. The kinetics of O_3 formation are presented. Competition studies, in the absence and presence of sulfur hexafluoride, show that C_2H_4 depresses the primary yield of oxygen atoms from pulse irradiated O_2, the maximum depression by C_2H_4 being the same as that by SF_6. (Author abstract modified)

31226 **APTIC NO. 52868**

Calvert, Jack G.

NON-RADIATIVE DECAY PROCESSES IN ISOLATED SO_2 MOLECULES EXCITED WITHIN THE FIRST ALLOWED ABSORPTION BAND (2500-3200 A). *Chem. Phys. Letters (Amsterdam), 20(5):484-488, July 1, 1973. 8 refs.*

New and previously published sulfur dioxide fluorescence emission data related to nonradiative decay processes are reviewed. All the present data support Mettee s contention, recently reinforced by Brus and McDonald, that nonradiative processes in SO_2 singlet photochemistry are unimportant. Any small inefficiency in the emission of light quanta for SO_2 excited at short wavelengths (2650 A) is largely due to the population of a second very short-lived state which is quenched effectively even at pressures down to 1 micron. The very low efficiency of quanta production observed at long wavelengths (3020 A) appears to have its origin not in the second easily quenched state, but more importantly, in the diffusional loss of the long-lived singlet which has a 20-fold greater lifetime than was previously expected for these conditions. (Author abstract modified)

31227 **APTIC NO. 52729**

Crittenden, Barry D. and Ronald Long

DIPHENYLENE OXIDE AND CYCLOPENTACENAPHTHYLENE(S) IN FLAME SOOTS. *Environ. Sci. Technol., 7(8):742-744, Aug. 1973. 10 refs.*

Sixteen polycyclic aromatic hydrocarbons were identified in soots from rich premixed flat flames of acetylene-oxygen and ethylene-oxygen, respectively, by gas chromatography combined with high-resolution mass spectrometry and/or ultraviolet spectrometry. A hitherto unidentified gas chromatographic peak lying between those of fluorene and anthracene plus phenanthrene is considered due to diphenylene oxide (dibenzofurane) and to the polycyclic aromatic hydrocarbons(s) represented by $C_{14}H_8$: probably pyracylene (or cyclopent(f,g)acenaphthylene) and possibly its isomer cyclopent(b,c)acenaphthylene. (Author abstract modified)

31228 **APTIC NO. 52753**

Dimitriades, Basil, B. H. Eccleston, G. B. Sturm, Jr., and C. J. Raible

THE ASSOCIATION OF AUTOMOTIVE FUEL COMPOSITION WITH EXHAUST REACTIVITY. *Bureau of Mines, Bartlesville, Okla., Bartlesville Energy Research Center, Rept. Invest. 7756, 55p., 1973. 15 refs.*

GPO

In an effort to associate automotive fuel composition with reactivity of exhaust emissions, a number of fuels of varied compositions were tested using several automobiles operated with standard engine adjustments. Exhaust reactivity was calculated using a reactivity scale and exhaust composition data, then statistically correlated with fuel composition expressed using each of several different component classification schemes. Levels of selected reactive exhaust components were also statistically correlated with fuel composition. Results for both correlations showed that correlations were improved when compositional detail was added to the simple classification as paraffins, olefins, and aromatics. Exhaust reactivity increased with increasing levels of polyalkylbenzenes in the fuel. Statistical analysis of mass emission data showed significant car and fuel effects on hydrocarbon, carbon monoxide, nitric oxide, total aldehydes, and formaldehyde emission levels and on total photochemical reactivity. Car-fuel interactions are considered to be negligible. (Author abstract modified)

31229 **APTIC NO. 53217**

Feugier, A.

THE MECHANISM OF COMBUSTION-GENERATED POLLUTANT FORMATION AND THEIR CONTROL. *(Mecanisme de la formation et controle des polluants dus a la combustion). Text in French. Sciences Techniques, no. 3:35-44, 1973. 10 refs.*

Physico-chemical mechanisms responsible for the formation of unburned hydrocarbons, carbon monoxide, unburned solids, and nitrogen oxides are reviewed. One cause of formation of unburned hydrocarbons is incorrect air-fuel ratio, another the so-called wall effect. Combustion velocity decreases rapidly near the wall of the chamber with the thickness of this zone dependent on heat diffusion towards the wall. Turbulent combustion with high heat diffusion leaves few unburned hydrocarbons; internal combustion engines generate little if any; diesel engines considerable amounts of unburned hydrocarbons. The CO emitted by internal combustion engines rises when the stoichiometric air-fuel ratio rises above 1; in heat generators, CO generation decreases with increasing excess of air. The oxidation kinetics of CO to carbon dioxide is slow. Unburned solids are soot formed in the gaseous phase with particle diameters between 0.01 and 0.05 micron and coke particles between 1 and 100 micron. The former escape with diesel engine and gas turbine smoke, the latter are the result of cracking of fuel droplets in liquid phase. While the concentration of unburned solids diminishes with excess air, the combustion of coke particles is slow. The reaction sequence leading to soot is complex with polyacetylenes as indispensable intermediary products when aliphatic hydrocarbons constitute the fuel. At high temperatures only nitric oxide exists, at ambient temperatures nitrogen dioxide is the stable form. The Zeldowich mechanism responsible for the formation of NO is a slow reaction; the higher the temperature, the more NO forms. In diesels with antechamber combustion, NO generation is markedly lower than in diesels with direct fuel injection. The critical point of NO formation is the rupture of the triple bond between two nitrogen atoms.

31230 **APTIC NO. 52723**

Fuller, M. J. and M. E. Warwick

THE CATALYTIC OXIDATION OF CARBON MONOXIDE ON TIN(IV) OXIDE. *J. Catalysis, 29(3):441-450, June 1973. 16 refs.*

The oxidation of carbon monoxide was investigated on catalysts obtained by thermal activation of granular hydrous tin (IV) oxide gel in the temperature range 200-500 C. These were active for this reaction at moderately low temperatures (less than 150 C). Thermogravimetry and nitrogen adsorption were used to investigate the water content and specific surface areas of the activated catalysts, and these parameters were related to the initial catalytic activities. The partial deactivation during carbon monoxide oxidation at low temperatures, which was accompanied by partial reduction of the catalyst surface, was studied as a function of both the activation and reaction temperatures. The kinetics of the steady state reaction were investigated at 180-210 C on the 450 C-activated catalyst, and the postulated mechanism involved adsorption of carbon monoxide, desorption of carbon dioxide, and oxygen regeneration of the catalyst. The kinetics can be represented by the Langmuir-type rate equation, similar to that derived for the same reaction on both V_2O_5 and Fe_2O_3, and this permitted evaluation of the experimental activation energies for the adsorption and desorption steps. (Author abstract)

31231 **APTIC NO. 53279**

Gab, S., W. Klein, and F. Korte

CONTRIBUTIONS TO ECOLOGIC CHEMISTRY. 56. PHOTOCHEMICAL REACTIONS OF THE ALDRIN/DIELDRIN METABOLITE DIHYDROCHLORDEN - 1,3 - DICARBONIC ACID. *(Beitraege zur oekologischen Chemie LVI. Photoreaktionen des Aldrin/Dieldrin-Metaboliten Dihydrochlorden-1,3-dicarbonsaeure). Text in German. Chemosphere, 2(3):107-110, May 1973. 11 refs.*

New metabolites of the insecticides aldrin and dieldrin are described which are due to photochemical reactions in the presence of ultraviolet light and atmospheric oxygen. The reaction products after irradiation may be identified following treatment with diazomethane. The new products are formed by: photoisomerization with 1,5, or 1,6 bridge formation as opposed to the well known 2,5 bridge formation; photohydrogenation of the double bond in the chlorinated five membered ring; and the introduction of a double bond into the nonchlorinated five membered ring by simultaneous hydrogenation of the chlorinated double bond. Only one example of photolytic ring opening is known thus far, that of chlordane. The occurrence of a ring opening product, with the same substance, and of products formed by means of a splitting of the ester points to a possible means of degradation of the compounds formed from these insecticides under environmental conditions.

31232 **APTIC NO. 52826**

Hussein, M. Fathy and W. Tabakoff

DYNAMIC BEHAVIOR OF SOLID PARTICLES SUSPENDED BY POLLUTED FLOW IN A TURBINE STAGE. *J. Aircr., 10(7):434-440, July 1973. 13 refs. (Presented at the American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 11th, Washington, D. C., Jan. 10-12, 1973.)*

The equations that govern the three dimensional motion of solid particles suspended by a compressible gas flow through a rotating cascade of a turbomachine are formulated. These equations are solved for the case of flow through a turbine stage. The solution takes into account the loss in particle momentum due to collision with the turbine blades or casing. The dynamic characteristics of the solid particles such as absolute trajectories, paths relative to the turbine rotor, velocity distributions, and the combined stage velocity diagrams are calculated. The effects of changing the particles mean diameter, material density, and initial particle and gas velocities at the stator inlet on the dynamic characteristics of the solid particles are investigated. The results indicate the locations on the turbine blades subjected to severe erosion damage. (Author abstract)

31233 **APTIC NO. 53075**

Huyton, D. W. and T. W. Woodward

GAMMA-RADIOLYSIS OF GASEOUS HYDROGEN SULPHIDE IN THE PRESENCE OF HYDROGEN CHLORIDE, CARBON DISULPHIDE AND NITROUS OXIDE. *J. Chem. Soc. Faraday Trans. I, 68(6):1049-1055, 1973. 23 refs.*

In gamma-radiolysis, addition of hydrogen chloride to hydrogen sulfide increased the radiation yield of hydrogen $G(H_2)$ from 7.0 to 10.0 by an electron scavenging process involving HCl and H_2S. Carbon disulfide lowered the H_2 yield in pure H_2S probably by reaction with hot H atoms; it also scavenged the electrons in the H_2S plus HCl mixtures, lowering $G(H_2)$ in the process to less than 7.0. Electron scavenging by addition of nitrous oxide to H_2S to produce nitrogen is a very complex system with surface reactions probably playing a part. (Author abstract modified)

31234 **APTIC NO. 53092**

Lal, M. M., M. [illegible] Kidwai, and S. H. Zaidi

CHEMICAL ASPECTS OF INDIAN VARIETIES OF ASBESTOS DUST. *Chemosphere, 2(2):73-76, 1973. 7 refs.*

Actinolite, anthrophylitte, amosite, chrysotile, and tremolite varieties of asbestos from Indian mines were analyzed for their chemical composition. Some significant differences in the chemical composition of the Indian varieties were found compared with South African and American varieties. For example, while the major portion of the iron in South African amosite exists in the ferrous form, 60% of the iron in Indian amosite exists in the ferric form. This difference may have import in terms of the carcinogenic properties of Indian amosite. The aluminum and magnesium content of the Indian varieties also differed from that of the foreign varieties, reflecting possible differences in the tissue response and hemolytic activity of the Indian and foreign varieties. These results indicate the need for detailed toxicological investigations into the Indian varieties of asbestos, particularly tremolite and actinolite, to determine the industrial and mining hazards presented by asbestos in India.

31235 **APTIC NO. 53164**

Lukchis, George M.

ADSORPTION SYSTEMS. PART III: ADSORBENT REGENERATION. *Chem. Eng., 80(8):83-90, Aug. 1973.*

Regenerative adsorption systems can be divided into two categories: drying and purification systems in which the sorbable component represents less than 3% of the bulk fluid; and bulk separation systems in which the sorbable component represents about 3 to 50% of the bulk fluid. A regenerative adsorption cycle may be classified according to the manner in which desorption occurs. With a thermal-swing cycle, desorption takes place at a temperature higher than that of the adsorption step. With a pressure-swing cycle, desorption is carried out at a pressure lower than that of the adsorption step. With a Purge gas-stripping cycle, desorption occurs primarily through the stripping action of a purge gas that is not adsorbed. With a displacement cycle, an initial adsorbate is desorbed by the action of a second sorbable fluid, which displaces all or part of the initial adsorbate. The characteristics of each cycle are discussed in detail. The equilibrium limits achieved at the end of each operating step of an adsorption-desorption cycle can be depicted as points on equilibrium diagrams. Important design information can be determined directly after plotting a cycle on an equilibrium diagram (e.g., maximum desiccant water capacity, minimum product-gas dewpoint, maximum regeneration-gas temperature). A simplified process design procedure for regenerative adsorption processes is summarized.

31236 **APTIC NO. 52717**

Matteson, Michael J. and Carl W. Sandlin

DIFFUSION OF AEROSOLS AT VARIOUS TEMPERATURES. *Aerosol Sci., vol. 4:307-315, 1973. 16 refs.*

The theory of diffusion of aerosols was previously verified experimentally at room temperature using large diffusion batteries of either parallel plates or long circular tubes. In this study the diffusion of aerosols was tested at low temperatures where classical Brownian movement theory may not apply. Tests were performed with a more compact diffusion battery consisting of newly developed discs of collimated hole structures with pores of 15.5 micron mean dia and an average length-to-diameter ratio of 32.7. Monodisperse sodium chloride aerosols of sizes in the range 0.3-0.5 micron produced in a LaMer-type furnace generator, were sampled with a particle mass monitor before and after penetration through four successive units of holes. At room temperature, the diffusion coefficient, calculated from experimentally observed penetrations, agreed with the theoretically predicted coefficients. However, at -16 and -72 C, the experimentally determined coefficients were 150-500% greater than the theoretically predicted values. (Author abstract)

31237 **APTIC NO. 53163**

Noweir, Madbuli H., Emil A. Pfitzer, and Theodore F. Hatch

DECOMPOSITION OF PHOSGENE IN AIR. *Am. Ind. Hyg. Assoc. J., 34(3):110-119, 1973. 42 refs.*

The thermal decomposition of 10 ppm of phosgene in air was studied under simulated environmental conditions involving: varying temperatures; varying time of contact with heated glass and/or iron surfaces; open flame; varying humidity; and the presence of carbon tetrachloride vapors. Temperature and time of contact with hot surfaces affected the degree and rate of decomposition. A clean iron surface enhanced decomposition and combined with the decomposition products at relatively low temperatures. Corroded iron surfaces enhanced decomposition, and chloride was liberated from those surfaces on contact with phosgene at relatively low temperatures. Humidity caused only a slight increase in decomposition. The degree of phosgene decomposition depended on the temperature of the open flame; phosgene was essentially completely decomposed on contact with a carbon monoxide flame. The presence of carbon tetrachloride and/or its decomposition products markedly decreased the decomposition of phosgene. Phosgene was decomposed to chloride, which was subsequently converted to chlorine by further heating. (Author abstract modified)

31238 **APTIC NO. 53032**

Penzhorn, R.-D., L. Stieglitz, W. G. Filby, and K. Guenther

A COMBINED MS-GC STUDY OF THE PHOTOREACTION OF SO2 WITH HYDROCARBONS. *Chemosphere, 2(3):111-118, May 1973. 14 refs.*

Gas chromatography and mass spectrometry were used to study the products of the photoreaction of sulfur dioxide with n-propane, n-butane, and n-pentane. The SO2-hydrocarbon mixture was irradiated with ultraviolet light. The following methylated products of the photoreaction were found in order of increasing retention time: methyl butyl sulfide, methyl butane sulfinates, dibutyl sulfides, methyl butane sulfonates, dibutyl sulfone, dibutyl disulfide, dibutyl thio sulfonates, dibutyl disulfone, and some unidentified peaks. The reaction mechanism for the SO2 photochemical reaction with HC is described.

31239 **APTIC NO. 53283**

Richard, J. R. and J. F. Lieberherr

THE COMBUSTION OF A HYDROCARBON DROPLET. I. THEORY. *(Combustion d une goutte d hydrocarbure. I. Theorie). Text in French. Rev. Gen. Thermique (Paris), 12(136):295-308, April 1973. 7 refs.*

The theoretical aspect of the combustion of hydrocarbon droplets is discussed, and a mathematical model is presented which demonstrates the principal equations involved and which takes into consideration the size of the area of the flame. The model is constructed so as to allow for as many degrees of freedom as possible, and this approach has made possible the solution of a system containing 23 unknowns. This system is linear, permitting the expression of all the variables by means of a small number of hypotheses. Only the temperature of the surface of the drop is unknown and may be adjusted by means of a nonlinear equation. The model is mainly constructed on the basis of the hypothesis applying to a quasistationary combustion; other hypotheses are introduced as the theory is developed.

31240 **APTIC NO. 53285**

Rigaudy, Jean, Joele Baranne-Lafont, Michel Moreau, and Nguyen Kim Cuong

THERMAL TRANSFORMATIONS OF THE PHOTOOXIDATION PRODUCTS OF ANTHRACENE. *(Transformations thermiques du photooxyde d anthracene). Text in French. C.R. Acad. Sci (Paris), Ser. C, 276(21):1607-1610, May 21, 1973. 4 refs.*

The photooxide of anthracene can be transformed successively into two dimers or an isomer and into the cyclobutene diether 3a, by heating its solution at different temperatures. The intermediary reaction, like that of the isomerization of the dimethyl photooxide 1b into 3b, would be an ortho-quinodimethane diether of type 5, which may be obtained in the presence of philodienes. A common precursor is thus envisaged for both the dimers and the 3a diether, whose cyclization at 3a can lead to dimerization when it is performed in a very dilute solution at a high temperature.

31241 **APTIC NO. 53280**

Schindler, G.

ELEMENTARY PROCESSES INVOLVED IN TURBULENCE. *(Elementarvorgaenge der Turbolenz). Text in German. Maschinenbautechnik, 22(4): 147-150, April 1973. 8 refs.*

Turbulent motion and its application in technical procedures involving flow are discussed. Methods for either increasing or suppressing turbulence are applicable to: promotion of increased turbulence in mixtures with the use of minimal intensification; suppression of turbulence to lessen resistance; optimal refining of fuel in the process of combustion; a study of impurities in atmospheric turbulence or problems dealing with spreading of explosive mixtures in the atmosphere and the maintenance of pure air; in studies of turbulence in transport of suspended particles in fluids; and in atmospheric processes. The characteristics of laminar and turbulent flow are represented graphically and mathematically; differences between laminar and turbulent eddies are of particular significance in the production of mixtures. Difficulties encountered in the calculation of boundary effects in turbulence measurements are discussed.

31242 **APTIC NO. 52863**

Slanger, Tom G., Bernard J. Wood, and Graham Black

INVESTIGATION OF THE RATE COEFFICIENT FOR O(3P) + NO2 YIELDS O2 + NO ASTERISK. *Intern. J. Chem. Kinet., 5(4):615-620, July 1973. 14 refs.*

Measurements of the rate coefficient of the reaction O(3P) + nitrogen dioxide equals oxygen + nitric oxide have been made at 296 K and 240 K, using the technique of excited NO2 chemiluminescent decay. Values of 0.0000000000093 cu cm/molecule/ sec at 296 K and 0.0000000000105 cu cm/molecule/sec at 240 K were obtained. (Author abstract modified)

31243 **APTIC NO. 52695**

Smy, P. R.

ROLE OF GAS BREAKDOWN IN THE CHARGING AND DISCHARGING OF MACRON CLOUDS. *Proc. Inst. Elec. Engrs. (London), 120(4):523-526, April 1973. 8 refs.*

When a pile of dust is dispersed by a blast of air, a charged cloud is formed. The action of gas breakdown due to intense space-charge fields generated on dispersal explains a surprising invariance in the net charge of the cloud with flow velocity, particle size, and material. When the cloud subsequently discharges to a small earthed electrode, the associated energy is of the order of that required to initiate a chemical explosion. This may be of significance in supertankers, where discharges from a charged mist are suspected to be a possible cause of explosions. The collision of particles in an electric field is an effective charging mechanism during dispersal, and later in the creation of a dust plasma. Electric oscillations of approximately the calculated plasma frequency 1000 to 10,000 Hz are observed. (Author abstract)

31244 **APTIC NO. 53177**

Stedman, Donald H. and Hiromi Niki

PHOTOLYSIS OF NO2 IN AIR AS MEASUREMENT METHOD FOR LIGHT INTENSITY. *Environ. Sci. Technol, 7(8):735-739, Aug. 1973. 17 refs.*

A chemiluminescent ozone/nitric oxide detector has been used to investigate the photolysis of nitrogen dioxide in air. The first 30 sec of photolysis provided a simple and rapid measurement of the light intensity, with the inhomogeneity of light intensity also capable of measurement; both parameters are important in photochemical smog studies. The experiment also provided for a check on the O3 calibration by turning off the lights. Comparison of kl and kd measurements, where kl is the effective light intensity determined directly by the photolysis of NO2 in air and kd is equal to the derivative of the natural log of the NO2 concentration with respect to time, confirmed recent work which gives a kl/kd ratio of 0.64. (Author abstract modified)

31245 **APTIC NO. 53284**

Toussaint, M.

AN EXPERIMENTAL PROCEDURE TO BE APPLIED FOR STUDYING A LIQUID FUEL FLAME. *(Methode d etude experimentale d une flamme de combustible liquide). Text in French. Rev. Gen. Thermique (Paris), 12(136):311-320, April 1973. 3 refs.*

A method is described for effective control of factors governing combustion which may be applied to the correction of poor organization of combustion, a factor in producing air pollution. The two parameters which determine such control are: the state of pulverization of a liquid and its distribution into drops; and the state of the combustion products and their distribution in the outflow. The method is based on the principle that a liquid is deflected around an obstacle placed in its path of flow, and that solid particles are not deflected but strike the obstacle or impactor. The design of the impactor is such that samples of the particles to be analyzed can be obtained on a plate with an adhesive surface over a given length of time. Sampling of droplets from an area close to the burner outlet is described whereby distribution of the drops in a given time interval can be determined by a photograph of the jet; the photograph permits both a very detailed analysis of the phenomena as well as a study of comparative results obtained by various devices. The comparison of carbon obtained from the analysis of carbon dioxide and carbon monoxide with that present in the initial fuel permits the estimation of the percentage of carbon lost.

31246 **APTIC NO. 52847**

Walker, R. E. and J. E. Creedan

THE REACTION BETWEEN NA VAPOR AND N2O AT ROOM TEMPERATURE. *Combustion Flame, 21(1):39-43, Aug. 1973. 9 refs.*

The gas-phase reaction between sodium metal vapor and nitrous oxide was examined at near room temperature in a fast-flow low pressure reactor using photmetric methods. The experiments were prompted by the greater prospect for developing a chemical laser when the initial temperature is low. The reaction rate is 7.6 times 10 to the plus 11th power cu cm/mole sec at 330 C and gives an activation energy of about 1100 cal/mole compared with published high-temperature rate data. The reaction is accompanied by Na D-line chemiluminescence, the intensity of which corresponds to Na-atom removal. A kinetic mechanism is suggested to explain this behavior. (Author abstract modified)

31247 **APTIC NO. 52724**

Wampler, Fred B., Kiyoshi Otsuka, Jack G. Calvert, and Edward K. Damon

THE TEMPERATURE DEPENDENCE AND THE MECHANISM OF THE SO2 (3B1) QUENCHING REACTIONS. *Intern. J. Chem. Kinet., 5(4):669-690, July 1973. 36 refs.*

The Arrhenius parameters were determined for the SO2(3B1) quenching reaction for 21 different molecules. The rate constants were calculated from phosphorescence lifetime measurements made over a range of reactant pressures and temperatures. Excitation of the SO2(3B1) molecules was accomplished by two methods: a 3829 Angstrom laser pulse generated the triplet directly through absorption within the band in the first method; and a broadband xenon-flash system generated SO2(3B1) molecules and triplets were formed subsequently by intersystem crossing in the second method. The measured rate constants were independent of the method of triplet formation employed. For the atmospheric gases, the activation energies (kcal/mole) were identical within the experimental error: nitrogen, 2.9 plus or minus 0.4; oxygen, 3.2 plus or minus 0.5; argon, 2.8 plus or minus 0.6; carbon dioxide, 2.8 plus or minus 0.4; carbon monoxide, 2.7 plus or minus 0.4; and methane, 2.5 plus or minus 0.6. Activation energies for SO2(3B1) quenching by the paraffinic hydrocarbons showed a regular decrease in the series ethane, neopentane, propane, n-butane, cyclohexane, and isobutane, which paralleled closely the decrease in C-H bond energies in these compounds. These and other data were most consistent with the dominance of chemical quenching in these cases. The rate constants for the olefinic and aromatic hydrocarbons and nitric oxide showed only very small variations with temperature change, and they were near the kinetic collision number. These data support the hypothesis that quenching in these cases is associated with the formation of a charge-transfer complex and subsequent interactions between the SO2(3B1) molecule and the pi-system of these compounds. (Author abstract)

31248 **APTIC NO. 53534**

Wendschuh, P. H., H. Fuhr, J. S. Gaffney, and J. N. Pitts, Jr.

REACTION OF PEROXYACETYL NITRATE WITH AMINES. *Chem. Commun., vol. 3:74-75, 1973. 10 refs.*

When ammonia, methylamine, or ethylamine was bubbled through a solution of peroxyacetyl nitrate (PAN), an exothermic reaction occurred immediately. In each case, the major organic product was the corresponding acetamide, with nitrous acid and nitrite ion also being formed. The corresponding acetamide was also formed when PAN reacted with ammonia or methylamine in the gas phase. When liquid n-propylamine or n-butylamine was injected into a solution of PAN, a vigorous evolution of oxygen was noted, with the corresponding acetamide being the only organic product detected: the reaction was quite rapid. In all of the reactions involving amines, over 90% of the amines were converted; the apparent yield of acetamide from ammonia was only 50 to 60%, probably because of the poor solubility of the amide in CDCl3 (in which the PAN was dissolved). No chemiluminescence in the visible region was observed from the reactions of PAN with primary or tertiary amines in the gas phase, and no emission at 1.27 micron due to singlet oxygen was detectable from the reactions of PAN with methylamine (gas phase) or n-butylamine (in solution).

31249 **APTIC NO. 53435**

Wharran, Gordon H., Jr.

A TECHNIC FOR THE PREPARATION OF LARGE SERIAL SECTIONS IN PLASTIC FILM MOUNTED ON MYLAR POLYESTER SHEETS. *Preprint, National Environmental Research Center, Research Triangle Park, N. C., Toxicology Branch, 6p., 1973. 2 refs.*

The preparation of large serial sections of whole oranges and large bone is considered too costly and impractical for most routine histology laboratories. A simple and inexpensive method which involves mounting the specimens on Mylar polyester sheets and covering them with Cyclon-Lack plastic media eliminates the use of large glass slides and cover glasses. Sections of whole lung, heart, kidney, and brain can be prepared in this way for serial sections, study sets, and large sections. A permanent base, suitable for use on the microscope stage, is provided for the specimen, and the remounting of multiple sections from broken glass slides is easily accomplished. Specimens mounted on Mylar sheets do not wrinkle and the films which are produced are no more vulnerable to scratching than glass slides. (Author abstract modified)

31250 **APTIC NO. 52751**

Wilson, M. T., M. Brunori, J. Bonaventura, and C. Bonaventura

EFFECT OF STEADY ILLUMINATION N THE BINDING OF CARBON MONOXIDE BY CARBOXYMETHYLATED CYTOCHROME C. *Biochem. J., 131(4):863-865, April 1973. 7 refs.*

The quantum yield for the dissociation of carbon monoxide from reduced carboxymethylated cytochrome c was derived. The values for the quantum yield were low relative to that for myoglobin and were pH independent. Quantum yield was 0.23 at pH 6.1 and 0.27 at pH 9.7. (Author abstract modified)

1972

31251 **APTIC NO. 52570**

Bell, Richard L.

RESIDENCE TIME AND FLUID MIXING ON COMMERCIAL SCALE SIEVE TRAYS. *Am. Inst. Chem. Engrs. J., 18(3):498-505, May 1972. 18 refs.*

A fiber optic technique was used to obtain point residence time distributions at several points on an 8-foot diameter sieve tray in hydrocarbon service. Residence time patterns were obtained over a wide range of vapor and liquid loadings with the isopropyl alcohol-water system and at both ends of the cyclohexane toluene system. The data reveal severe flow nonuniformities on the tray including nonuniform velocity distribution and retrograde flow near the column walls. Three factors causing retrograde flow are nonuniform pressure distribution at the tray inlet, stagnation at the outlet weir, and flow separation because of the jetting action at the center of the inlet. (Author abstract modified)

31252 **APTIC NO. 53113**

Bradstreet, Jeffrey Willis

EFFECTS OF NITRIC OXIDE ON THE PHOTOCHEMICAL OXIDATION OF SULFUR DIOXIDE IN DILUTE GAS-AIR MIXTURES. *Syracuse Univ., N. Y., Dept. of Sanitary and Municipal Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., June 1972. 87p. 42 refs.*

The kinetics of the photooxidation of sulfur dioxide as influenced by nitric oxide were studied at 35 C and an intensity of 54 volts. Sulfur dioxide was analyzed by a modified starch-iodine method. Relatively low NO concentrations (0.45 and 0.7 ppm) enhanced the photooxidation of 3.2 ppm SO2, while relatively high NO concentrations (1.52 and 2.23 ppm) inhibited it for a period of time. After the delay period, which varied directly with NO concentration, photooxidation proceeded at a catalyzed rate. Overall reaction rate constants indicated a first order reversible relationship between SO2 and NO. The inhibiting effect of NO was offset by the presence of moisture. At 26% relative humidity, the increase in the photooxidation rate varied inversely with NO concentration; at 50% relative humidity, no delay time was ovserved. The initial presence of nitrogen dioxide also offset the inhibiting effect of the higher NO concentrations, indicating competion between NO and SO2 for oxygen atoms. Nitrogen dioxide did not, however, catalyze the enhancing effects of the lower NO concentrations, suggesting that the catalytic effects of NO2 and NO are synergistic rather than additive. The results indicate that initially high NO concentrations in power plant plumes will delay the photooxidation of SO2. The oxidation of NO to NO2 and/or the presence of moisture in a dispersing plume or ambient air should increase the conversion of SO2 to sulfuric acid mist.

31253 **APTIC NO. 52565**

Brian, P. L. T. and J. R. Ross

THE EFFECT OF GIBBS ADSORPTION ON MARANGONI INSTABILITY IN PENETRATION MASS TRANSFER. *Am. Inst. Chem. Engrs. J., 18(3):582-589, May 1972. 21 refs.*

A theoretical analysis of Marangoni convection in gas-liquid mass transfer shows the stabilizing effect of surface convection in the Gibbs adsorption layer. Results are obtained for various ratios of liquid layer thickness to mass transfer penetration depth. For deep liquid layers, complete stabilization results when the inventory in the Gibbs layer equals the solute deficiency in the liquid phase boundary layer, irrespective of the shape of the unperturbed concentration profile. This new theory agrees much better with experimental results than did previous theories. For triethylamine desorption from water, the discrepancy is reduced from a factor of 8000 to a factor of eight. One possible source of the residual discrepancy may be inadequacies in the theory due to the use of the frozen-profile assumption. (Author abstract modified)

31254 **APTIC NO. 52547**

Capes, C. E. and A. E. McIlhinney

EXPANSION OF PARTICULATE MIXTURES IN SCREEN-PACKED GAS-FLUIDIZED BEDS. *Trans. Inst. Chem. Engr. (London), 50(1):1-5, Jan. 1972. 9 refs.*

The expansion characteristics of mixtures of particles of a wide variety of sizes and densities air-fluidized in screen-packed beds were investigated. The experimental expansion curves were compared with predictions based on a simple summation of the contributions due to the component particles. Good agreement was found in most cases. Stratification in the mixed beds was also investigated qualitatively, and the factors which control mixing behavior were considered. (Author abstract)

31255 **APTIC NO. 52550**

Chiba, T., K. Terashima, and H. Kobayashi

BEHAVIOUR OF BUBBLES IN GAS-SOLID FLUIDIZED BEDS: INITIAL FORMATION OF BUBBLES. *Chem. Eng. Sci., 27(5):965-972, May 1972. 11 refs.*

The successive formation of gas bubbles on the gas distributor of a multi-orifice plate in two-dimensional air-fluidized beds was studied both theoretically and experimentally. A brief theory for the initial bubble formation, which reflects the effects of fluidized particles, was developed based on the assumption that the forming bubbles do not coalesce with the foregoing bubbles until they grow to a suitable enough size to detach themselves from the spout formed on the orifice. Measurements were made on the change in the size and the position of forming bubbles and bubbles immediately after formation in the two-dimensional fluidized beds consisting of particles of different shapes and diameters. A good agreement was found between the theoretical and the experimental results. (Author abstract)

31256 **APTIC NO. 52562**

Edwards, D. K. and A. Balakrishnan

VOLUME INTERCHANGE FACTORS FOR NON-HOMOGENEOUS GASES. *J. Heat Transfer, 94(2):181-188, May 1972. 16 refs.*

Interchange factors describing the radiation heat transfer between two gas-volume elements or between one such element and a wall element were convenient for treating a variety of engineering problems, such as those involving combustion chambers, furnaces, and plumes. When the gas was not homogeneous in temperature, composition, or pressure, gas-volume interchange factors were complex functions of the geometrical arrangement and the temperature, composition, and pressure fields which affect the radiant properties in the gas within and between the elements. A simplified expression was derived for the rapid calculation of such factors, and comparisons were made with exact numerical computations. Both took into account nongray spectral variations in gas properties. The case of adjoining elements required special treatment, and results are presented. Volume interchange factors and the machine time necessary to compute them are reported to demonstrate the relative ease with which such factors can be obtained using the approximations developed. (Author abstract)

31257 **APTIC NO. 52616**

Formenti, M., F. Juillet, P. Meriaudeau, S. J. Teichner, and P. Vergnon

PREPARATION IN A HYDROGEN-OXYGEN FLAME OF ULTRAFINE METAL OXIDE PARTICLE. OXIDATIVE PROPERTIES TOWARD HYDROCARBONS IN THE PRESENCE OF ULTRAVIOLET RADIATION. *J. Colloid Interface Sci., 39(1):79-80, April 1972. 15 refs.*

Divided metal oxide aerosols (alumina, iron dioxide, germanium dioxide, silica, titanium dioxide, vanadium pentoxide, and zirconium dioxide) are prepared by carrying metal chloride vapor into the flame of an oxygen-hydrogen burner. Collected oxide particles do not have internal porosity and exhibit a nearly constnat diameter between 100-2000 A. The geometry of these particles and their crystalline structure depend on the flame temperature, the flow rate of carrier gas, and the linear velocity of the chloride vapor in the burner. Binary, ternary, or doped oxides may also be prepared by this method from the appropriate mixture of metal chlorides. Oxygen at 25 C is adsorbed on some oxides, in particular on TiO2, in the presence of ultraviolet radiation, as a labile species O2(-) which reacts with paraffins, olefins, carbon monoxide, sulfur dioxide, and nitric oxide, under irradiation, to give products of partial or total oxidation. The registered quantum yield is equal to one for wavelengths not exceeding 3400 A. Electron spin resonance measurements of the reactivity of O2(-) species toward isobutane are reported. (Author abstract modified)

31258 **APTIC NO. 53403**

Goodsel, A. J. and B. Blyholder

ADSORPTION OF CO2, COS and CS2 ON MANGANESE FILMS. *J. Catalysis, 26(1):11-17, July 1972. 18 refs.*

Infrared, mass spectral, and volumetric techniques were used to examine the interaction of carbon dioxide, carbonyl sulfide, and carbon disulfide with an evaporated manganese surface. Carbon dioxide dissociated on the surface to give gas phase carbon monoxide and an adsorbed carbon dioxide complex with infrared bands at 1580, 1305, 1050, and 825/cm, indicating a bidentate attachment of the complex. Carbonyl sulfide dissociated to give gas phase CO and, simultaneously, leave a sulfided surface. With neither CO2 nor carbonyl sulfide was chemisorbed CO found; this was as expected with CO2 since CO2 will displace chemisorbed CO on a manganese surface, while CO will not displace chemisorbed CO2. Experimental evidence indicates that carbon disulfide is adsorbed dissociatively on the surface; this reaction appeared to be of smaller magnitude than the first two. (Author abstract modified)

31259 **APTIC NO. 52655**

Killgoar, Paul Charles, Jr.

PHOTOIONIZATION MASS SPECTROMETRY: A STUDY OF NO2 AND NO. *Michigan State Univ., East Lansing, Dept. of Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 119p. 56 refs.*

The discrepancies among the reported values for the ionization potential of nitrogen dioxide lead to a reinvestigation of this molecule by means of photoionization mass spectrometry. A study of the threshold region revealed considerable autoionization structure. Fragmentation of NO2 into nitric oxide ion and oxygen was also studied and the dependence of the dissociative lifetime of metastable NO2 ion on the quantum state of its bending vibration was investigated. The observed autoionization structure of the NO2 ion photoionization efficiency curve was assigned to Rydberg series converging to higher ionization potentials. The photoionization efficiency curve of NO ion was also obtained. Considerable fine structure was observed in the threshold region (9.25-10.0 eV) which was attributed to vibrational autoionization. This structure was assigned to Rydberg series converging to the excited vibrational levels of the ground NO ion. The autoionization structure above threshold was correlated with existing Rydberg series of the NO molecule. (Author abstract modified)

31260 **APTIC NO. 53116**

Lawrence, William Rex

DEPOSITION OF DILUTE AEROSOLS FROM TURBULENT GAS FLOWS IN THE PRESENCE OF ELECTRICAL FORCES. *Georgia Inst. Tech., School of Aerospace Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., July 1972. 250p. 105 refs.*

The purpose of this research is to develop theoretical solutions for aerosol concentration distribution and deposition flux for several flow configurations of practical interest. The effort is divided into two categories: deposition in the absence of electrical forces and deposition in the presence of electrical forces. The various analyses included are focused toward the turbulent flow case and include consideration of particle coagulation to the extent possible. Several analytical solutions are found which, in many cases, offer an improvement in available prediction capability. Numerical solutions for the problems of interest are developed. Advantage is taken of the discrete-ordinate method to achieve accurate results when coagulation effects are included. A mixing-length hypothesis provided a basis for constructing an analytical approach for conveniently predicting, with reasonable accuracy, aerosol deposition from these two flow configurations when electrical effects are absent. An analysis of the influence of coagulation upon the overall deposition on neutral aerosols indicates that there is little effect upon overall mass transport for the conditions chosen for study. The influence of turbulent diffusion was small relative to overall deposition in the presence of electrical forces, although its influence upon particle concentration profile is more significant. (Author summary modified)

31261 **APTIC NO. 52533**

Russell, Glen A., Robert K. Norris, and A. R. Metcalfe

ELECTRON TRANSFER PROCESSES. XV. ADDITION OF NITRIC OXIDE AND NITROGEN DIOXIDE TO ANIONS OF NITRO ALKANES AND OXIMES. *J. Am. Chem. Soc., 94(14):4959-4963, July 12, 1972. 22 refs.*

Nitrogen dioxide and nitric oxide reacted in basic solution with the acid anions of primary aliphatic nitro alkanes (Nitronates) to give the gem-dinitro power dianion radicals (RC(NO2)2) to the -2 power and gem-nitronitroso radicals (RC(NO2)(NO)) to the -2 (R equals H, D, Me, Et). The production of the latter radicals in the reaction of NO2 with nitronates (R equals Me, Et) is noted and a source proposed. Nitromethane at low base concentration gave with NO2 the dinitronitrosomethyl dianion radical. Formaldoxime gave with both NO and NO2 the dinitrosomethyl dianion radical. The dinitrosethyl dianion radical anion was also prepared by reduction of aqueous solutions of potassium acetonitrosolate. Acetaldoxime gave the nitronitrosomethyl dianion radical with NO2. Deuterium exchange for the radicals where R equals H was rapid, but did not occur in the dinitrosomethyl dianion radical. (Author abstract modified)

31262 **APTIC NO. 53331**

Shyu, R. R., C. S. Chen, G. O. Goudie, and M. M. El-Wakil

MULTI-COMPONENT HEAVY FUEL DROP HISTORIES IN A HIGH-TEMPERATURE FLOW FIELD. *Fuel, 51(2):135-145, April 1972. 17 refs.*

The behavior of combustible fuel drops was studied. Concurrent analytical and experimental studies of temperature and mass histories during the vaporization, combustion, and thermal decomposition of a multi-component liquid-fuel drop in a high-temperature flow field were performed. The fuel investigated was of residual type, a mixture of heavy liquid hydrocarbons. Irregular burning of drops of these fuels has been attributed mainly to asphaltenes and partly to unstable resin components. In the analytical work, temperature-dependent mean properties of both the liquid drop and the boundary layer of air/fuel vapor mixture were employed. Assumptions were adopted to simplify the analytical model. Four governing differential equations in combination with three boundary conditions were reduced by the Zeldovich method to two simultaneous ordinary differential equations for drop mass and drop temperature histories. These were solved numerically by the Runge-Kutta method on a CDC 3600 computer. A simple extension gave a breakdown of the heat balance. The analytical predictions improved on previous predictions using constant properties. The heat of decomposition and the total heat input to the drop per unit initial drop mass during the liquid phase were unaffected by airstream temperature and initial drop size in the range studied. (Author abstract)

31263 **APTIC NO. 53386**

Tanaka, Ken-ichi and George Blyholder

PHOTOCATALYTIC REACTIONS ON ZINC OXIDE. III. THE HYDROGENATION OF ETHYLENE. *J. Phys. Chem., 76(10):1394-1397, May 11, 1972. 25 refs.*

The hydrogenation of ethylene taking place over zinc oxide was studied both under dark and illuminated conditions, with the reaction rate and adsorption simultaneously measured during reaction. No photo-effects were observed on catalytic activity, adsorption of ethylene, or on the kinetics. Reactivity sequence studies showed ethylene to be far more reactive than propylene on ZnO, while relative adsorption strengths on ZnO showed the opposite sequence; both of these sequences are the reverse of those previously observed on tricobalt tetroxide. These trends suggest that Pi-complexes of olefins are favored on Co3O4, while allyl forms are favored on ZnO. Hydrogenation of ethylene on zinc oxide at room temperature appears therefore not to be directly related to the electronic band structure of the catalyst. Reactions proceeding on interstitial zinc are suggested to be photosensitive, while those occurring on other sites or on strained sites are likely to be photoinsensitive. (Author abstract modified)

31264 **APTIC NO. 52555**

Tycholiz, D. R. and A. R. Knight

REACTIONS OF THIYL RADICALS. PART VIII. PHOTOLYSIS OF METHYL ETHYL SULFIDE VAPOR. *Can. J. Chem., 50(11):1734-1742, June, 1, 1972. 6 refs.*

Methyl ethyl sulfide was photolyzed in the vapor phase with wavelengths between 2000 and 2350 A, and the effects of pressure, temperature, and exposure time were investigated. The vapor phase absorption spectrum of the sulfide was determined, and the variation in the nature and rates of formation of products in the presence of carbon dioxide, tetrafluoromethane, propylene, and 2-pentene were measured. Quantum yields of products from the decompositon of the pure substate were determined at 2288 A. The products of the reaction were, in order of decreasing importance, ethane, methyl ethyl sulfide, diethyl disulfide, methane, dimethyl sulfide, diethyl sulfide, propane, ethylene, dimethyl disulfide, butane, ethyl mercaptan, and methyl mercaptan. A carbon/sulfur mass balance was obtained at all substrate pressures at 25 C, and the single substrate pressure was examined at 120 C. In the presence of propylene four additional products, n-pentane, methyl propyl sulfide, di-n-propyl sulfide, and allyl ethyl sulfide were found. (Author abstract modified)

1971

31265 **APTIC NO. 53333**

Novitskii, N. V. and G. I. Khromykh

A METHOD FOR RAPID DETERMINATION OF TOTAL SULPHUR IN COALS. *Thermal Eng. (English translation from Russian of: Teploenergetika), 18(4):136-137, April 1971. 5 refs.*

The total sulfur in coal can be rapidly and precisely determined using a recently synthesized indicator for barium ions (nitchromaso). The sulfur determination is conducted at a pH of 1.7 to 2.0 in a 50% water-alcohol or water-acetone medium. When no barium ions are present, the indicator in the titrated medium is violet in color; at the end point, when all sulfate ions are combined with the barium ions, the violet coloring changes to greenish-blue. The procedure was tested using coal samples with sulfur contents varying between 2.5 and 10.04%. The results agreed well with those obtained by the lengthier and more laborious weighing method. The time required for determining total sulfur in one sample is 1.5 hours, and maximum quantities of the salts of sodium, potassium, calcium, magnesium, iron, and aluminum within the coal do not influence the titration results. The proposed method can be used in the chemical laboratories of power stations.

31266 **APTIC NO. 52639**

Smith, I. W.

THE KINETICS OF COMBUSTION OF PULVERIZED SEMI-ANTHRACITE IN THE TEMPERATURE RANGE 1400-2200 DEG K. *Combustion Flame, 17(3):421- 428, Dec. 1971. 20 refs.*

The rates of combustion of four size-graded fractions of semi-anthracite (78, 49, 22, and 6 micron) were measured in the temperature range 1400-2200 K and at oxygen partial pressures of 0.1 and 0.2 atm. The rates were usually much less than the limiting rate of oxygen diffusion to the particles. For the 78-, 49-, and 22-micron fractions, the chemical reaction rate coefficients, calculated from the measured rates corrected for external diffusion resistance, were independent of particle size and of burn off up to 99% burn off. The particles burned with decreasing size and density. The temperature coefficient of the reaction corresponded to an apparent activation energy of about 20 kcal/mole. These factors indicated that the reaction is limited by the combined effects of pore diffusion and chemical reaction on the pore walls. The chemical reaction rate coefficients were independent of oxygen partial pressure at 0.1 and 0.2 atm. The absolute values of the rates and other results agreed well with those of previous workers for anthracites and semi-anthracites. The values of the chemical rate coefficient for the 6-micron fraction were lower than for the larger fractions, such behavior indicating that this fraction burned with little restriction by pore diffusion. The results were compared with the data of other workers for the combustion rates of anthracites and semi anthracites. (Author abstract)

31267 **APTIC NO. 53153**

Spicer, Chester William, Jr.

KINETIC STUDIES OF SOME REACTIONS OF SO2, NO, AND NO2. *Pennsylvania State University, Dept. of Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., Dec. 1971, 126p. 71 refs.*

Reaction schemes, kinetic considerations, and mechanistic hypotheses are presented for the reaction of nitrogen dioxide with tetrafluoroethylene, the photolysis of sulfur dioxide in the presence of C2F4, and the reactions of methylperoxy radicals with nitric oxide and nitrogen dioxide. A low value corresponding to the Arrhenius preexponential factor for the acetyl fluoride (O2NCF2CFO) in the first set of experiments runs contrary to other indications of homogeneity, and no definitive explanation for such a preexponential factor can be offered. The electronic states involved in chemical reaction when SO2 is irradiated at 3130 A in the second series of experiments are clearly different from the emitting states. The fact that addition of NO could not completly quench the chemical reaction indicates two such non-emitting states, one a singlet and one a triplet. The crucial feature of the last study is that the methylperoxy radical does not react with NO to produce a methoxy radical and NO2 nor with NO2 to produce the CH3O radical.

31268 **APTIC NO. 53527**

Sprung, J. L., H. Akimoto, and J. N. Pitts, Jr.

NITROGEN DIOXIDE CATALYZED CIS-TRANS ISOMERIZATION OF CIS-2-BUTENE. *J. Am. Chem. Soc., 93(18):4358-4363, Sept. 8, 1971. 23 refs.*

Nitrogen dioxide catalyzes the cis-trans isomerization of cis-2-butene in the gas phase. At room temperature and for nitrogen dioxide pressures of 0.1 to 3.0 torr and cis-2-butene pressures of 1.0 to 30 torr, the reaction is first order in both reactants and appears to be homogeneous. At room temperature the reaction has a second order rate constant of 0.148 + or 0.0031/mol/sec. Over the temperature range 298 to 338 K, the Arrhenius parameters of the reactions are log A (1/mol/sec) equals 8.1 + or 0.2 and Ea equals 12.1 + or - 0.3 kcal/mol. Thermochemical calculations show that these Arrhenius parameters are consistent with a free radical isomerization mechanism. (Author abstract)

31269 **APTIC NO. 52551**

Tesner, P. A., E. I. Tsygankova, L. P. Guilazetdinov, V. P. Zuyev, and G. V. Loshakova

THE FORMATION OF SOOT FROM AROMATIC HYDROCARBONS IN DIFFUSION FLAMES OF HYDROCARBON-HYDROGEN MIXTURES. *Combustion Flame, 17(3):279-285, Dec. 1971. 4 refs.*

The rate of particle formation in the thermal decomposition of aromatic hydrocarbons in diffusion flames of hydrocarbon-hydrogen mixtures was measured. Particle formation rate-time curves had a similar form for all hydrocarbons investigated and possessed a characteristic maximum. The particle formation rate at the maximum was of the order of 10 to the 14th power particles/ cu cm/sec. The overall activation energy of the particle formation process determined from the temperature coefficient of the rate was between 140 and 180 kcal/mole. The experimental procedure, characteristics of the hydrocarbon-hydrogen mixture flames, and the rate of soot particle formation are discussed.

1970

31270 **APTIC NO. 53373**

Ravey, Jean-Claude and Samuel Premilat

OPTICAL PROPERTIES OF CARBON BLACK SUSPENSIONS *(Proprietes optiques de suspensions de noirs de carbone). Text in French. J. Chim. Phys., no. 67:1913-1921, 1970. 13 refs*

Light absorption, diffusion, and extinction coefficients of different carbon black suspensions in such solvents as water, acetone, cyclohexanone, and acetophenone, were studied. The carbon black suspensions were generated by an ultrasonic disintegrator. The light diffusion measurements for carbon black concentratons of 0.000001 g/cu m and less were carried out by means of a photogoniodiffusiometer at light wavelengths ranging from 5460 to 4360 Angstrom. The extinction, scattering, and absorption coefficients measured show the importance of the structure of carbon black aggregetes regarding their optical properties. The compactness and the dimension of the elementary sphere of carbon black are the predominant parameters. The turbidity of the suspension contributes considerably to the optical density of the carbon black suspensions. It is possible to determine at a relatively high degree of precision the optical properties of carbon black suspensions composed of relatively small spheres, whose aggregates are of reduced compactness.

EFFECTS-HUMAN HEALTH

1973

31271 **APTIC NO. 52836**

Japan Environmental Agency, Inter-service Training Inst. on Environmental Pollution

AIR POLLUTION AND HEALTH. *(Taiki osen to kenko). Text in Japanese. 21p., May 1973.*

The definition of environmental pollution, the relationship between man and his environment, the relationship between environmental pollution and health, and environmental standards are briefly discussed. Environmental standards are determined for administrative purpose, as guidelines for local environmental control, as goals for achieving local environmental standards, and as criteria for judging local conditions. The effects of pollution on health and the evaluation depend on how to measure the distance between normal good health and damaged health, whether examinations are given individually or locally by groups, and how to analyze various environmental factors. The age, air pollution degree, smoking habits, profession, and the spiritual and psychological environment are some of the factors affecting human health.

31272 **APTIC NO. 53073**

Permanent Commission and International Association on Public Health, Task Group on Metal Accumulation

ACCUMULATION OF TOXIC METALS WITH SPECIAL REFERENCE TO THEIR ABSORPTION, EXCRETION AND BIOLOGICAL HALF-TIMES. *Environ. Physiol. Biochem., vol. 3:65-107, 1973. 211 refs.*

Exposure to potentially toxic metals can cause adverse health effects by inhibiting enzyme activities and changing the metabolism of other metals. The mechanisms of absorption, transport, retention, distribution, and excretion of metals are reviewed with special reference to biological half-times and accumulation. Primary consideration is given to cadmium, lead, mercury, and their compounds. The two principal routes for absorption are inhalation and ingestion; these are discussed in detail. A brief review of absorption by placental transfer is included. Absorption of 10-40% of inhaled cadmium has been estimated; as the gastrointestinal absorption of cadmium is relatively small, the major part of this absorption is transpulmonary. Transpulmonary absorption of organometallic compounds of lead and mercury is probably about 80% of the inhaled amount. Gastrointestinal absorption is 5-15% for lead, less than 0.01% for elemental mercury, and about 7% for inorganic mercury. Autopsy evidence indicates that by age 50, 1/3 of the body burden of cadmium is in the kidney. Lead tends to increase in bone and aorta with age. Inorganic mercury tends to accumulate in the kidney and mercury vapor and methyl mercury in the brain. Blood, urine, and hair values are useful indexes of body burdens of metals. Epidemiologic studies of defined populations are needed to relate changes in tissue metal levels to changes in the environment.

31273 **APTIC NO. 53225**

DISCUSSIONS AT THE JAPAN-U. S. COMMITTEE ON AIR POLLUTION I. *(Nichi-bei kokagaku taiki osen iinkai no togi kara). Text in Japanese. MOL. J., 11(8):16-17, Aug. 1973.*

The effects of photochemical air pollution on plants, human health, and the future cooperation of Japan and the U. S. are discussed. Results of U. S. studies on the effects of air pollution on plants are mentioned including species susceptibility, effects on tissues and cells, heredity effects, and plant resistance. Nitrogen dioxide is not only toxic to humans as a photochemical oxidant, but is poisonous itself. The effects of photochemical reactants, autombile exhaust, and personal factors must be considered. Damage occurring when ozone concentrations are low are possibly due to unknown substances. The stronger effects of photochemical smog in Japan are due to heredity factors, sulfur dioxide, and humidity. The effects of pollutants are stronger at peak values than at 1-hour values. Eye irritation in Los Angeles is caused by peroxyacetyl nitrate. There are some differences between both countries in the effects of nitrogen oxides on human health. In the future, there will be more interchange of information between the U. S. and Japan concerning air pollution toxic effects and the use of indicator plants.

31274 **APTIC NO. 53488**

Niigata Prefecture (Japan), Hygienic Dept.

SUMMARY OF A RESULT OF INVESTIGATION INTO THE EFFECT OF AIR POLLUTION IN THE JOETSU AREA ON HUMAN BODY. *(Joetsu chiku ni okeru taiki osen no jinta; oyobosu eikyo chosa seiseki no yoyaku). Text in Japanese. 7p., March 1973.*

Investigation by questionnaires distributed to 5154 residents in a polluted area and 295 residents in a control area revealed that 886 residents of the former group (17.2%) and 18 residents of the latter group (6.1%) had subjective symptoms in the respiratory system. In 313 randomly selected samples from the polluted area, 55 persons (17.6%) had pulmonary fibrosis and 17 persons (5.43%) had respiratory symptoms including chronic bronchitis and bronchial asthma. The persons with the same symptoms in the 295 samples from the control area were 8.8% and 2.03%, respectively. The results indicated that there were noticeable differences between residents from the polluted area and those from the control area.

31275 **APTIC NO. 53077**

Alarie, Y., I. Wakisaka, and S. Oka

SENSORY IRRITATION BY SULFUR DIOXIDE AND CHLOROBENZILIDENE MALONONITRILE. *Environ. Physiol. Biochem., vol. 3:53-64, 1973. 32 refs.*

Sulfur dioxide (17-298 ppm) and o-chlorobenzilidene malononitrile (CBMN) (2.4 and 75 micrograms/l of air) initiated sensory irritation of the upper respiratory tract in Swiss albino mice, as indicated by respiratory depression. With SO2 the reaction was accompanied by desensitization (i.e., return to control values) within a few minutes of continuous exposure, while with CBMN the sensory irritation persisted at the same level during the entire exposure period. The desensitized state related to SO2 exposure was specific for this agent. Mice desensitized to SO2 reacted to CBMN as control mice not previously exposed to SO2. The degree of sensory irritation by SO2 varied directly with the logarithm of the concentration, while the time for its appearance varied inversely with this factor. A sequence of events for sensory irritation and desensitization is suggested based on the reducing properties of sulfite toward disulfide bonds in a receptor protein. (Author abstract modified)

31276 **APTIC NO. 53252**

Amaya, Kazuo

SEEKING AFTER THE CAUSE OF THE SO-CALLED PHOTOCHEMICAL SMOG - CYAN THEORY - APPEALING TO CHEMISTS FOR THEIR CO-OPERATION. *(Iwayuru kokagaku sumoggu no genin o saguru (shian setsu) - genin kyumei ni kagakusha no kyoryoku o uttaeru). Text in Japanese. Kagaku to Kogyo (Tokyo) (Chem. Chem. Ind.), 26(8):465-467, Aug. 1973.*

The relationship of photochemical smog symptoms to hydrogen cyanide and other cyanides is described. The symptoms of cyanides are very similar to the symptoms occurring during photochemical smog episodes in Tokyo such as eye irritation, reddening of the face, and tiredness. While Los Angeles smog episodes often coincide with high oxidant concentrations, Tokyo cases often occur during low oxidant concentration periods. This suggests the possibility of the existence of substances which react with oxidants and form harmful components. Cyanide compounds fulfill the former condition and ammonium thiocyanate fulfills the latter.

31277 **APTIC NO. 52840**

Anderson, Einar, Robert J. Andelman, Joseph M. Strauch, Nicholas J. Fortuin, and John H. Knelson

EFFECT OF LOW-LEVEL CARBON MONOXIDE EXPOSURE ON ONSET AND DURATION OF ANGINA PECTORIS. A STUDY IN TEN PATIENTS WITH

ISCHEMIC HEART DISEASE. Ann. Internal Med., 79(1):46-50, July 1973. 21 refs.

The cardiovascular effects of exposure to low levels of carbon monoxide were ascertained on 10 adult males with stable angina pectoris. The patients breathed air containing 50 or 100 ppm CO for 4 hr on 5 successive days. After each exposure a standard treadmill-exercise electrocardiogram was recorded. The time of onset and duration of anginal pain were recorded. Mean carboxyhemoglobin level after air inhalation was 1.3%, rising to 2.9% after 50 ppm CO, and to 4.5% after 100 ppm CO. Mean duration of exercise before onset of pain was significantly shortened after both 50 and 100 ppm CO in comparison with air. The duration of pain was significantly prolonged after 100 ppm compared with air, but not after 50 ppm. Electrocardiograms recorded during and after exercise generally showed worsening of ST-segment changes, with earlier onset and longer duration of ST-segment depression. Low CO levels can cause decreased exercise tolerance and worsening of myocardial ischemia in patients with angina pectoris. (Author abstract modified)

31278 **APTIC NO. 53060**

Archie, Joseph P., Jr.

A MATHEMATICAL MODEL FOR PULMONARY MECHANICS: THE ALVEOLAR SURFACE CONTRIBUTION. *Int. J. Eng. Sci., 11(6):659-671, June 1973. 19 refs.*

A rationally motivated, one degree of freedom, scalar, mathematical model was developed from a statement of conservation of mass and surface thermodynamics to represent the contribution of alveolar surface tension to the mechanics of respiration. A relationship for dynamic surface tension as a function of area was obtained while developing the model. The model predicts spatial average values of the transalveolar-surface pressure as a function of time for the whole lung, not necessarily true at any specific alveoli at that time. The present value of pressure is a function not only of the present lung volume, but also the volume history. The transpulmonary pressure is formulated in terms of the pressure due to airway resistance, that of deformation of lung tissue, and the transalveolar surface pressure. New lung constants arise in a natural way from the model. The pulmonary mechanics predicted by the model are consistent with the concept that normal lung alveolar surface tension is below the thermostatic equilibrium value and is maintained in such a state by occasional deep inspirations. (Author abstract)

31279 **APTIC NO. 53487**

Ascik, Kazimierz

TOXIC PROPERTIES OF CHLORINE DIOXIDE EMITTED IN THE BLEACHING PROCESS. *(Wlasciwosci toksyczne dwutlenku chloru wydzielajacego sie w procesie bielenia). Text in Polish. Przegl. Papier., no. 5:100-101, 1973. 17 refs.*

Increased utilization of chlorine dioxide in the paper and synthetic fibers industries has led to research concerning the toxic properties of chlorine dioxide. Chlorine dioxide irritates the respiratory system and is more dangerous than chlorine. People who work in an atmosphere containing 0.003 to 0.005 mg/l ClO2 (1-1.66 ppm) experience unpleasant smell, sore eyes, and irritation of the nasal membranes after 30 to 45 sec. Cats exposed to ClO2 reacted with sneezing, coughing, restlessness, asfixia, and progressive weakness. A foamy discharge and salivation at the snout occurred. Rabbits had eye irritation, discharge of mucus from the nose, unrest, and suffocation symptoms. Mice rubbed their snouts with their paws, ran around in the chamber, and ended by flocking in small groups. Sections conducted on animals killed by ClO2 revealed purulent tracheitis, bronchitis, and bronchial pneumonia. In cats, the heart was considerably enlarged, accompanied by a weakening of the heart muscle. Guinea pigs withstood the ClO2 action at concentrations from 0.038 to 0.046 mg/l for 6 hr. Textile plant workers working in an atmosphere containing 0.6 ppm ClO2 were studied. Of 20 employees, only 2 did not show morbid changes. The most common symptoms were coughing, labored respiration, running nose, bleeding from the nose, nausea, and headache. The patients were suffering from emphysema, acute bronchitis, and respiratory insufficiency. Prolonged treatment did not improve their health. Due to 60% loss of health, the workers had to be pensioned. The highest allowable concentration of ClO2 in the air is 0.0001 mg/l in Poland. The American standard of 0.003 mg/l is considered too high, therefore exceedingly dangerous. Poisoned people should be carried into fresh air, and exposed to no effort; artificial respiration is counterindicated. Prevention measures include wearing masks absorbing acid gases. Insulation breathing apparatuses should be used for the cases of installation failure.

31280 **APTIC NO. 52733**

Austin, R. H., K. Beeson, L. Eisenstein, H. Frauenfelder, I. C. Gunsalus, and V. P. Marshall

DYNAMICS OF CARBON MONOXIDE BINDING BY HEME PROTEINS. *Science, 181(4099):541-543, Aug. 10, 1973. 12 refs.*

Rebinding of carbon monoxide to myoglobin and to cytochrome P-450 after removal by a light flash occurred down to 50 K for myoglobin and 25 K for cytochrome P-450 in glycerol-water solution. Above 240 K the reaction was second order; between 240-200 K, the reaction became exponential and independent of CO concentration. Below 150 K the reaction followed a power law and was approximately 10 to the 3rd power times faster for cytochrome P-450 than for myoglobin. (Author abstract modified)

31281 **APTIC NO. 52686**

Balazova, G.

URINARY FLUORIDE ELIMINATION AND FLUORINE DEPOSITION IN BONES AND TEETH OF THE RATS AFTER INHALATION. *Fluoride, 6(3):151-154, July 1973.*

Urinary fluoride elimination and fluoride deposition in bones and teeth of rats after inhalation was studied. Rats in the experiment inhaled fluoride in concentrations of 9.4-11.7 micrograms/l of air for a period of 5 mo. The animals were divided into four groups, three exposed and one control. The first group was exposed 90 hr, the second 180 hr, and the third 270 hr to hydrogen fluoride in the inhalation chamber. After inhalation, rapid absorption of fluoride in the organism took place. This was indicated by increased elimination of fluorides in the urine, the occurrence of characteristic changes in the dental enamel, and elevation of fluoride in bones and teeth, without radiographic changes. The changes following inhalation are the same as those for oral administration. Fluoride absorbed by the lung was eliminated rapidly from the organism; the amount present in the urine depended upon the duration of the exposure. About 1/3 of the inhaled fluoride was eliminated in the urine. Fluoride deposition in bones and teeth increased regardless of the duration of intoxication. No increase in fragility of the bones was noted in relation to their fluoride content. (Author abstract)

31282 **APTIC NO. 53090**

Bates, D. V.

THE RESPIRATORY BRONCHIOLE AS A TARGET ORGAN FOR THE EFFECTS OF DUSTS AND GASES. *J. Occup. Med., 15(3):177-180, March 1973. 20 refs.*

The effects of industrial dusts and gases on the small airways within the lung are discussed. A study in which men were exposed to asbestos dust showed that the lung s dynamic compliance was reduced in the absence of major airway effects. This suggests that the small airways are affected early in this condition. Similarly, there are indications that the small airway is a site of the early effects of coal dust, a conclusion which is supported by the occurrence of focal emphysema in coal workers. With respect to industrial gases, the results of recent experiments have indicated that exposure to ozone causes edema and some obstruction within the small airways. There is also presumptive evidence that the small airways are important targets for the effects of the oxides of nitrogen. In studying the effects of dusts and gases on the lung, attention should be directed to the small airways since the effects on these are subtle and likely to be missed by crude tests of function. Also, by virture of the normal aging process of the lung, their function is likely to become more important as a person grows older, whether or not he is still exposed to the original irritant.

31283 **APTIC NO. 53319**

Berry, J. P., P. Galle, and M. Stupfel

ANALYSIS WITH AN ELECTRONIC MICROPROBE OF THE INTRAPULMONARY DEPOSITS IN RATS EXPOSED DURING ALL THEIR LIFE TO AN AUTO EXHAUST GAS DILUTION. *(Analyse des depots intra-pulmonaires chez des rats exposes au gaz d echappement de moteur automobile). Text in French. Nouv. Presse Med., 2(27):1856-1858, July 1973. 6 refs.*

Male Sprague-Dewley rats were exposed to diluted automobile exhaust gas containing 57 + or 12 ppm carbon monoxide, 0.37 + or 0.11% carbon dioxide, 23 + or - 6 ppm nitrogen oxides, 2 ppm aldehydes, 0.5 mg of hydrocarbons/l, and dust, 8 hr/day for 5 days/wk for 2 yr for the study of the deposits in the lungs. The test chamber walls retained deposits that contained, like the walls of a control test chamber, silicon, aluminum, iron, titanium, lead, chromium, copper, and manganese. The black pigment deposits in the lungs of both the control and the test animals contained silicon, aluminum, iron, titanium, and calcium. In addition, the calcified pleural and alveolar zones of the lungs of the test animals contained manganese and copper in the deposits, although neither copper nor manganese was found in lung deposits in urban inhabitants. No lead in lung deposits in city dwellers was detected in other investigations.

31284 **APTIC NO. 53162**

Blumenthal, Warren B.

ZIRCONIUM IN THE ECOLOGY. *Am. Ind. Hyg. Assoc. J., 34(3):128-133, March 1973. 29 refs.*

The interaction between living species and the zirconium compounds which have existed in the earth s crust and water is discussed. Zirconium is a nontoxic element, whose chemical behavior has made it unsuitable for roles in the structures of living organisms or in their biochemical processes. At present, some zirconium is being introduced into natural water, and through water into a number of simpler living organisms, via industrial wastes. They provide zirconium in more assimilable compositions than those previously available. However, the known ecological hazards of zirconium may be considered negligible. It is likely that advantageous changes will be made by industry, substituting safe zirconium compounds for metal compounds which are of similar function but which are serious pollutants. For example, supplanting chrome tannage with zirconium tannage would eliminate serious problems involved in the safe disposal of waste chromium. Similarly, zirconium can be used to reduce the levels of cobalt and manganese in paint driers and the amounts of copper and mercury used to protect textiles from rotting. (Author abstract modified)

31285 **APTIC NO. 53083**

Bowden, Drummond H.

THE ALVEOLAR MACROPHAGE AND ITS ROLE IN TOXICOLOGY. *Crit. Rev. Toxicol., 2(1):95-124, June 1973. 241 refs.*

The role of the alveolar macrophage in pulmonary clearance is examined. The reactive spectrum of the macrophage from a quiescent monocyte-like cell to an activated cell synthesizing digestive enzymes and packed with phagolysomes suggests a cellular system that is readily triggered to cope with unusual inhalant loads. This efficient adaptive mechanism is also capable of keeping air sacs free from injurious particulates and immunogenic agents. Pathologic changes supervene only when the adaptive capacity is overwhelmed; this may occur with a massive inhalant load as experienced by the farmer in his dusty barn or by the inhalation of toxic particles or gases that injure the macrophages. Factors that interfere with phagocytosis and enzymatic synthesis by the macrophage can allow bacterial infection to become established in the lungs. In a few instances, noticeably with silica, direct participation of the macrophage appears to be an integral part of a fibrogenic response. There is no convincing evidence for a direct causal relationship between macrophagic injury and emphysema, but dislocation of pulmonary clearance mechanisms is undoubtedly an important factor in the genesis of toxicologic injury to the lung. (Author conclusions modified)

31286 **APTIC NO. 53501**

Camner, Per and Klas Philipson

URBAN FACTOR AND TRACHEOBRONCHIAL CLEARANCE. *Arch. Environ. Health, 27(2):81-84, Aug. 1973. 11 refs.*

Tracheobronchial clearance in humans was studied by having subjects inhale a test aerosol of 6 micron Teflon particles (density, 2 g/cu cm) tagged with technetium and by measuring the radioactivity for about 2 hr. Comparisons of clearance were carried out in 15 pairs of nonsmoking, monozygotic twins (aged 49-64) of which one of each pair lived in Stockholm and the other in a rural district or small city. No significant difference in clearance occurred between the members of each pair. (Author abstract modified)

31287 **APTIC NO. 53571**

Cassel, John

THE RELATION OF THE URBAN ENVIRONMENT TO HEALTH: IMPLICATIONS FOR PREVENTION. *Mount Sinai J. Med., 40(4):539-550, July-Aug. 1973. 74 refs.*

The relationship of urban environment to health is discussed, and social principles with implications for prevention of disease are presented. Attempts to demonstrate that increased population density and crowding are related to poorer health status in humans are conflicting. General principles relating to the human social systems can be derived from animal studies that offer convincing evidence that social processes influence health. Changes in group membership and the quality of the membership produce neuroendocrine changes in animals that can markedly alter the homeostatic mechanisms of the body. Circumstantial evidence supports the view that when humans are unfamiliar with the expectations of the society in which they live, their actions are unlikely to lead to the consequences they anticipate, and they become more susceptible to disease than those individuals for whom the situation is familiar. Not all members of a population are equally susceptible to the effects of these social processes. There are biologic and social buffers which act as protective factors. The biologic category includes the adoptive capacity of all living organisms. This is evidence by the lower lung cancer statistics among individuals living a lifetime in urban pollution, as compared to farm born persons who migrate to the cities. Protective social processes are the nature and strength of the group supports provided to the individual. Manifestation of ill health is a genetic predisposition of the individual and the nature of physical, chemical, or microbiologic environment.

31288 **APTIC NO. 52867**

Colley, J. R. T., J. W. B. Douglas, and D. D. Reid

RESPIRATORY DISEASE IN YOUNG ADULTS: INFLUENCE OF EARLY CHILDHOOD LOWER RESPIRATORY TRACT ILLNESS, SOCIAL CLASS, AIR POLLUTION, AND SMOKING. *Brit. Med. J. (London), 3(5873):195-198, July 29, 1973. 9 refs.*

The prevalence of cough during the day or night in winter was studied in 3899 20-year-olds. These were members of a cohort born in England, Scotland, and Wales in the last week of March 1946. The prevalence of cough and current smoking habits were related to events recorded during infancy and childhood: exposure to air pollution (estimated from domestic coal consumption for the towns and rural areas where the children lived), social class of father, and lower respiratory tract illness under 2 years of age. At age 20, cigarette smoking had the greatest effect on symptom prevalence, following by a history of respiratory tract illness under age 2. Social class and air pollution had little effect. (Author abstract modified)

31289 **APTIC NO. 52946**

Coyne, L. D.

BITUMEN EMULSIONS FOR UNSEALED ASPHALT MIXTURES AND COATINGS ON OLD PAVEMENTS. *(Bitumenemulsionen fuer offene Asphaltmischungen und Ueberzurege auf alten Decken). Text in German. Bitumen-Teere-Asphalte-Peche, 24(7):309-315, 1973. (Presented at the Road Builders Clinic, Annual Meeting, 23rd, Moscow, Idaho, March 1972.)*

Unsealed asphalt mixtures have been in use for years for road supporting structures and for pavement. They have advantages concerning traffic safety and ecology. On a 1 mi stretch an unsealed asphalt mixture with grains 3.4/9.5 mm containing about 5.5% by weight bitumen emulsion CMS-2h and a mixture with few interstices, a maximum grain size of 12.5 mm and about 6.9% by weight bitumen emulsion CSS-1h were tested. The two mixtures were applied to a 2.5 mm thick coating of existing asphalt. The rest of the stretch was covered with a 1.3 cm thick hot-mix coating with few interstices. No measurable difference between the dust quantities driven off by the wind from hot-mix or cold mixing stations was observed. A comparison in this case was not quite justified because both processes operated with relatively dry material with the aid of a drying drum, and dust and wet collector. The sole difference was that with cold-mixing the rocks were not heated. Generally, however a cold-mixing station operates with rock which had been wetted. In this case no visible emissions occur upon loading of the cold-mix on trucks. Also, no flue gas develops since the dryer is not in operation and no emissions occur at the transfer of the material to the distributor and during application. The best composition of unsealed cold mixed bitumen emulsions the application and lifetime is discussed. (Air pollution discussed on page 310).

31290 **APTIC NO. 52894**

Cuomo, Anthony J., Gennaro M. Tisi, and Kenneth M. Moser

RELATIONSHIP OF DL SUB CO(SB) AND K SUPERSCRIPT M-1 TO LUNG VOLUME AND PARTITION OF PULMONARY PERFUSION. *J. Appl. Physiol., 35(1):129-135, July 1973. 16 refs.*

Diffusing capacity for carbon monoxide by single-breath technique (Dl sub CO(SB)) is a function of alveolar volume and the rate of uptake of carbon monoxide during breath holding, referred to as Krogh s constant. The relationship of Dl sub CO(SB) and the Krogh constant to the alveolar volume was studied in supine dogs in which ventilation-perfusion relationships were optimized by increasing the alveolar volume under conditions of positive alveolar pressure. The line of best fit for the relationships in five dogs was: Dl sub CO(SB) equal to 11.3 times the alveolar pressure plus 4.2. The 95% confidence interval of the y intercept (-2.3 to +10.7) included zero, indicating that Dl sub CO(SB) increased in direct proportion to alveolar volume. The relationship was interpreted to have been caused by the optimized relationship of ventilation to perfusion present in the model. The effect of an unequal partition of perfusion on Dl sub CO(SB) was also determined in three dogs. The Dl sub CO(SB) under isovolume-cardiac output conditions decreased as the partition of perfusion was changed. The data indicated that diffusion capacity was more intimately dependent on the partition of perfusion than on cardiac output alone. (Author abstract)

31291 **APTIC NO. 52832**

Deknudt, Gh., A. Leonard, and B. Ivanov

CHROMOSOME ABERRATIONS OBSERVED IN MALE WORKERS OCCUPATIONALLY EXPOSED TO LEAD. *Environ. Physiol. Biochem., 3(3):132-138, 1973. 17 refs.*

Chromosome observations were performed on peripheral blood lymphocytes of 14 workers from a zinc industry who have presented signs of lead poisoning of different degrees. According to type and duration of exposure, the workers examined were divided into three groups: those exposed to a high level of zinc and low levels of lead and cadmium; those exposed to high levels of the three minerals; and those exposed to high levels of lead and cadmium in the absence of zinc. The aberrations were dicentrics, rings, chromatid exchanges, as well as gaps and fragments. Exposure to zinc and cadmium does not seem to increase the number of cells with severe chromosome anomalies, and lead intoxication can be considered to be responsible for the chromosome aberrations. (Author abstract)

31292 **APTIC NO. 52895**

Dinius, D. A., T. H. Brinsfield, and E. E. Williams

EFFECT OF SUBCLINICAL LEAD INTAKE ON CALVES. *J. Animal Sci., 37(1):169-173, July 1973. 19 refs.*

Sixteen bull calves were fed a 70% concentrate diet containing either: no supplemental lead, sufficient ground newsprint to give 10 ppm supplemental lead, lead chromate to give 10 ppm supplemental lead, or lead chromate to give 100 ppm supplemental lead. Fecal and urine samples were collected and EKG and respiration rates were monitored at 25-day intervals. At the end of 100 days, the calves were sacrificed and samples of skeletal muscle, cerebral cortex, liver, and kidney were collected for lead analysis. Supplemental lead did not affect feed consumption nor weight gain; however, newsprint depressed both intake and gain. Neither EKG patterns, heart rate, nor respiration rate were affected by dietary treatment. The percentage of ingested lead excreted in feces and urine was not significantly different among treatments. There were no significant tissue accumulations of lead from feeding newsprint or 10 ppm lead chromate; however, feeding 100 ppm lead chromate resulted in accumulations of the element in liver and kidney. Samples of cerebral cortex, liver, and kidney cortex were examined by electron microscopy. Changes were not detected in the cellular ultrastructure of these tissues from either control or treated animals. (Author summary modified)

31293 **APTIC NO. 53027**

Ehrenreich, T., A. D. Mackler, A. N. Langer, and I. J. Selikoff

ASBESTOS FIBERS IN HUMAN LUNGS: FORENSIC SIGNIFICANCE IN ENVIRONMENTAL DISEASE. *(Les fibres d amiante dans les poumons humains: leur signification medico-legale dans les maladies de l environnement). Text in French. Arch. Maladies Profess. Med. Trav. Securite Sociale (Paris), 34(4-5):189-204, April-May 1973. 34 refs. (Presented at the International Meeting of Forensic Sciences, 6th, Edinburgh, Scotland, Sept. 20-26, 1972.)*

Clinical, pathological, and epidemiological evidence shows that asbestos exposure is an important health hazard. Direct occupational exposure is associated with pulmonary parenchymal fibrosis, pulmonary carcinoma, and plural and peritoneal mesothelioma, following a long lapsed period after the initial exposure. Indirect occupational and environmental exposure may also cause lung diseases. Direct occupational exposure may cause death or contribute to death and should be investigated by a forensic pathologist. Investigation of indirect occupational or environmental exposure is optional. Medical-legal investigation should include circumstances of death, occupational history, place of residence, clinical history, autopsy, and identification and quantification of asbestos bodies and fibers. Detection and characterization of asbestos in lungs and lung lesions may be carried out on a light microscope first, using the conventional 5 micron H and E section and the 175 micron ashed stacked tissue method. If this is negative, a sub-microscopic examination of the tissues is necessary using carbon extraction and examination by transmission electron microscopy. Infrequently, selected area diffraction and microchemical analysis with electron microprobe analyzer are useful.

31294 **APTIC NO. 53045**

Elia, Victor J., Lalitha Murthy, and Harold G. Petering

ISOLATION OF METAL-BINDING AGENTS FROM LETTUCE CIGARETTE SMOKE AND THEIR EFFECT ON O_2-UPTAKE OF LIVER SLICES. *Environ. Letters, 5(1):7-16, 1973. 10 refs.*

Lettuce leaf cigarettes, a tobacco substitute, were smoked under standardized conditions, and the smoke condensate (LSC) was collected. The LSC, amounting to 7.3 mg/cigarette, was fractionated yielding copper-complexing fractions (60% of the total weight) and a noncomplexing fraction (40% of the total). These values were compared with results for tobacco smoke condensate which yields about five times the total solids, of which 25% is copper-complexing fractions. The ligands from the LSC were inhibitors of oxygen-uptake by rat liver slices, a metalloenzyme requiring system. Thus, the ligands may have adverse effects on cellular energetics, since they could interact in vivo with essential trace elements such as copper, zinc, manganese, and iron, depending on their biochemical form and matrix and therefore alter the metabolism of these metals. These results suggest the possibility of a generality of these properties to dried and burned vegetable matter, and further suggest potential applicability of the methods to general air pollutants. (Author abstract modified)

31295 **APTIC NO. 52952**

Evans, J. C., R. J. Evans, A. Holmes, R. F. Hounam, Diane M. Jones, A. Morgan, and M. Walsh

STUDIES ON THE DEPOSITION OF INHALED FIBROUS MATERIAL IN THE RESPIRATORY TRACT OF THE RAT AND ITS SUBSEQUENT CLEARANCE USING RADIOACTIVE TRACER TECHNIQUES. 1. UICC CROCIDOLITE ABSESTOS. *Environ. Res., 6(2):180-201, June 1973. 21 refs.*

Radioactive tracers were used to study the distribution of crocidolite asbestos in the upper and lower respiratory tracts after single short inhalations of the nose only type. With the UICC standard reference sample of crocidolite, 45-55% of the deposited asbestos was in the lower respiratory tract of the exposed rats. After 30 days the lung content of the asbestos was reduced to 73% of the initial value. Autoradiography was used to study the distribution of asbestos within the lung immediately after exposure and after 30 days. The clearance of crocidolite from the respiratory tract was followed by measurement of radioactivity in the feces. (Author abstract modified)

31296 **APTIC NO. 53564**

Ferlinz, R.

THE ETIOLOGY OF CHRONICAL BRONCHITIS. *(Die Aetiologie der chronischen Bronchitis). Text in German. Muench. Med. Wochschr. (Munich), 115(34):1417-1421, 1973.*

A constitutional predisposition is necessary for the development of chronic bronchitis. If this is present, then various environmental and health factors such as smoking, exposure to dusts, fumes, and gases, air pollution, allergies, infections, diseases of the bronchi, and climate can encourage its development. Bacterial infections occur frequently in chronic bronchitis as a secondary infection, but their presence is not necessary for chronic bronchitis. The influence of air pollution on the development of chronic bronchitis depends on the intensity and duration of exposure. In urban areas chronic bronchitis is more frequent than in rural areas. Also it occurs more frequently in larger cities than in smaller ones. During air pollution episodes, such as the famous one in London, chronic bronchitis patients may suffer a sudden deterioration of their physical condition. In London, 4000 chronic bronchitis patients died within a few days. But such episodes are the exception. In none of the industrial cities is the general pollution so high that acute effects on human health are observed similarly to occupational exposure.

31297 **APTIC NO. 53037**

Fletcher, B. L. and A. L. Tappel

PROTECTIVE EFFECTS OF DIETARY ALPHA-TOCOPHEROL IN RATS EXPOSED TO TOXIC LEVELS OF OZONE AND NITROGEN DIOXIDE. *Environ. Res., 6(2):165-175, June 1973. 18 refs.*

The effect of dietary alpha-tocopherol (especially in the 0-45 mg/kg range) on the acute toxicity of ozone and nitrogen dioxide to rats was studied. The highest level of alpha-tocopherol was 1500 mg/kg of diet in combination with ascorbic acid, DL-methionine, and butylated hydroxytoluene; the O_3 level ranged from 0.7 to 16 ppm; NO_2 ranged from 20 to 25 ppm; and various exposure periods were used. The alpha-tocopherol alone and in combination with the other antioxidants exerted a protective effect in rats exposed to O_3 and NO_2 as measured by acute toxicity and animal weight change. During 1 ppm O_3 exposure, voluntary activity decreased; at lower O_3 levels (0.7-0.8 ppm), alpha-tocopherol protection against lipid peroxidation in the lung was a reciprocal function of the logarithm of dietary alpha-tocopherol. Extracts of lung tissue from animals exposed to O_3 and oxygen showed no increase in fluorescent products associated with lipid peroxidation. (Author abstract modified)

31298 **APTIC NO. 53465**

Frappier-Davignon, L., S. Jegier, C. Drouin, J. Marier, L.-P. Roy, and F. J. Tourangeau

A STUDY OF THE COMBINED EFFECT OF AIR POLLUTION, OCCUPATIONAL EXPOSURE, AND SMOKING HABITS RESULTING IN OBSTRUCTIVE LUNG DISEASES. 1. METHODOLOGY. *(Etude de l effet combine de la pollution atmospherique de l exposition professionnelle et des habitudes de tabac dans les affections pulmonaires obstructives). Text in French. Union Med. Canada, 102(7):1537-1541, July 1973. 12 refs.*

Methodological aspects are described of a study that was conducted in Canada to determine if different sources of pollution, such as polluted urban air, professional exposure to industrial emissions, and cigarette smoking have an independent, cumulative, or a synergistic effect on the human organism. Employees of a foundry, a petroleum refinery, and a food processing plant, and the populations living around these industries in Montreal were studied during 1965 and 1966. At the same times, an urban zone with elevated pollution level, and another with low pollution level in the Montreal area were distinguished by systematic air pollution monitoring. In this manner, a test group practically not exposed to industrial pollution (employees in a food processing plant, subjects in hospitals, schools, offices), another group exposed to chemical compounds (employees of petroleum refinery, pulp and paper mill, printing house, chemicals manufacturing plant), a dust exposed group (foundry, quarry, mine, and cement works employees), a group exposed to both dust and chemical compounds (railroad company, steelworks, ship-building, building and automobile industry), and another group exposed to carbon monoxide (truck and cab drivers) were distinguished. A total of 2688 persons were interviewed, and their pulmonary function was evaluated by means of the McKesson Vitalor spirometer. The air pollution monitoring conducted in and around Montreal revealed settling dust concentrations ranging from 11.9 to 32.9 tons/sq m/mo in 1965, and from 10.7 to 32.7

tons/sq m/mo in 1966. The suspended matter and sulfur trioxide concentrations were in the respective ranges of 64-156 mg/cu m and 0.7-2.9 mg/100 cu cm/day.

31299 APTIC NO. 53058

Gibbs, Bruce P., Edward J. Smith, and Samuel R. Powers, Jr.

A MATHEMATICAL MODEL OF MASS TRANSPORT IN THE LUNG. *Int. J. Eng. Sci., 11(6):625-635, June 1973. 6 refs.*

A mathematical model of mass transport in the lung is concerned with gaseous diffusion in the region distal to the terminal bronchioles, following the suggestion that in this region the airflow is small and gaseous diffusion accounts for practically all of the mass transport. Differential equations are solved by state variable techniques utilizing a computer program which calculates the partial pressures of oxygen and carbon dioxide in ventilated blood as a function of ventilation rate. The program includes the effects of O2 and CO2 dissociation curves and calculates for each lobe of the lung independently. The model has good correlation with published data. (Author abstract modified)

31300 APTIC NO. 53034

Goedken, Virgil L., JoAnn Molin-Case, and Young-ae Whang

MONOCARBON MONOXIDE COMPLEXES OF IRON (II): SYNTHESIS AND X-RAY STRUCTURAL CHARACTERIZATION. *Chem. Commun., no. 10:337-338, May 23, 2973. 10 refs.*

Several monocarbon monoxide complexes of iron(II) with a macrocyclic ligand were prepared; a crystal structure of one of these complexes showed that the iron (single bond) carbon (triple bond) oxygen angle was linear, 178 deg, with an Fe-C distance of 1.75 A and an unusually long axial iron-nitrogen distance of 2.12 A. An understanding of the binding of small molecules such as oxygen, carbon monoxide, nitric oxide, and hydrogen sulfide to iron in biological heme systems is important.

31301 APTIC NO. 52820

Gordon, R. J., R. J. Bryan, J. S. Rhim, C. Demoise, R. G. Wolford, A. E. Freeman, and R. J. Huebner

TRANSFORMATION OF RAT AND MOUSE EMBRYO CELLS BY A NEW CLASS OF CARCINOGENIC COMPOUNDS ISOLATED FROM PARTICLES IN CITY AIR. *Intern. J. Cancer (Copenhagen), 12(1):223-232, July 15, 1973. 14 refs.*

The customary benzene extraction of airborne particulate matter collected in Los Angeles, California, yields carcinogenic material. The residue from the benzene extraction contains substances soluble in methanol, some of which are organic. This methanol extract and a number of its component fractions were tested in rodent cell culture systems developed as assay methods for screening carcinogens. In one system a high-passage Fisher rat embryo cell line was used. In the other a low-passage cell line derived from NIH Swiss albino mouse embryos and infected with AKR leukemia virus was used. In both systems the methanol extract showed cell transformation activity approaching that of 3-methylcholanthrene. In the mouse cell system the activities of several fractions were also examined. The major inorganic component, ammonium nitrate, showed no activity. Neither the neutrals alone, nor the recombined non-neutral fractions separately, showed any activity, although they were active together. The basic materials separated by ion exchange were also active. The methanol extract combined with the conventional benzene extract showed much lower activity than either extract alone. (Author abstract modified)

31302 APTIC NO. 52725

Gregg Ian and A. J. Nunn

PEAK EXPIRATORY FLOW IN NORMAL SUBJECTS. *Brit. Med. J. (London), 3(5874):282-284, Aug. 4, 1973. 16 refs.*

The relationship between peak expiratory flow (PEF), age, and height was studied in 202 men and 199 women in southwest London. Strict criteria of normality were employed in the selection of subjects. Multiple regression techniques were used to determine the form of the relationship for each sex. The experimental results were compared with those of other authors, and possible reasons for differences were considered, including smoking, residence in a polluted area, and incorrect performance of the test. (Author abstract)

31303 APTIC NO. 53547

Grinten, Willem J., van der

COMPOSITE MEMBRANE USEFUL IN NONINVASIVE SENSOR FOR GASES AND VAPORS. *(General Electric Co., Schenectady, N. Y.) U. S. Pat. 3,724,175. 5p., April 3, 1973. 6 refs. (Appl. Aug. 5, 1971, 8 claims).*

A two-phase membrane construction useful in noninvasive sensors for gases and vapors is presented. The membrane construction comprises a perforated substrate of essentially nonpermeable material, each perforation of which is impregnated with solid polymer material. Means are also provided adjacent to the surface of the substrate for equalizing the gas flux over the surface of the polymer-filled perforations. An exemplary two-phase membrane in a membrane/vacuum/mass spectrometer combination is described for use in the non-invasive ontime monitoring of gas and vapor partial pressures on the skin (or body membranes) of patients, in body fluids held in vitro, or in a patient s blood.

31304 APTIC NO. 53222

Guseva, V. A.

PECULIAR FEATURES OF FORMALDEHYDE EFFECT IN CASE OF ITS JOINT ADMINISTRATION BY RESPIRATORY AND ORAL ROUTES. *(Osobennosti deystiviya formal degida pri odnovremennom postuplenii ingalyatsinnom i peroral nom putem). Text in Russian. Gigiena i Sanit., no. 5:7-11, 1973. 5 refs.*

The effects of small concentrations of formaldehyde on male rats were studied by adopting simultaneous oral and inhalatory administration for 7 months. The ineffective concentration was determined to be 0.25 mg/cu m in inhalation and 0.01 mg/l orally. Rats exposed to such concentrations had practically normal conditioned reflex activity, and showed a tendency of increased cholinesterase activity, as well as elevated histamine and sulfhydryl group levels. Reduction of the latency period of light reflexes, tendency of increased alanine aminotransferase and cholinesterase activities, as well as increased histamine and SH group levels were observed in another group exposed to threshold concentration of formaldehyde (0.5 mg/cu min inhalation and 0.1 mg/l orally). Rats exposed to one half the ineffective concentrations displayed no deviations from the control group regarding the conditioned reflex activity, the oxydase, alanine, and asparagine aminotransferase activities, and the histamine and SH group levels. Summation effect of inhaled and orally ingested formaldehyde, and a latent phase of intoxication in the form of temporary adaptation were determined.

31305 APTIC NO. 53256

Hamada, Susumu

ONE OF THE OCCUPATIONAL DISEASES IN PULMONARY SYSTEM, PNEUMOCONIOSIS. *(Shokugyo-sei kokyuki shikkan, Jinhai). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), 26(7):862-866, 1973. 10 refs.*

Pneumoconiosis-like changes are frequently found in the respiratory systems of Kobe city inhabitants who had no occupational exposure to dust. Occupational cases of pneumoconiosis are compared to the effects of air pollution (dust) on man. Symptoms, X-rays, pulmonary function, and amount of exposure are mentioned.

31306 APTIC NO. 52795

Hayashi, Toru and Hidenori Dodo

REGIONAL HEALTH - A MEDICAL INVESTIGATION OF CHILDREN SUFFERING FROM BRONCHIAL ASTHMA IN OTAKE, KURE, AND FUKUYAMA CITIES. *(Chiiki boken - Otake, Kure, oyobi Fukuyama-shi ni okeru kikanshizensoku jido no ekigakuteki chosa seiseki). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), 26(5):584-589, May 1973. 7 refs.*

Fifth graders of seven schools in Fukuyama, fourth graders from three schools in Otake, and all graders from eight schools in Kure were selected and given a questionnaire on their health. A second screening was given by an interview with a physician, and those suspected of asthma were given a health examination, a lung function test, and X-ray test. Otake and its vicinity are highly polluted. But the children from the less polluted Kuba area showed the highest morbidity. This may suggest the effects of not only the present degree of pollution, but the trend of pollution over the past years. In Otake and its vicinity, pollution is heavy but the rate has remained at the same level for the past several years. In Kuba, pollution is lighter, but it is constantly increasing. However, compared with Kure and Fukuyama, morbidity in Otake is extraordinarily high. In Kure, high morbidity was noted in three schools. Two schools are located in high sulfur oxide concentration areas; the third area has a lower SOx rate, but the rate of settling particles is the highest of all eight. In a school where the SOx and settling particle rate were both lowest, morbidity was not significantly low statistically speaking, but was one of the lowest along with some others. Another significant finding was that more than 50% of the allergic children had close family members with one of the major allergies; frequent asthmatic records in the families and personal allergy history also showed a close relationship with the childrens asthmatic conditions.

31307 APTIC NO. 52738

Hee, J. and R. Guillern

THE INFLUENCE OF ENVIRONMENTAL FACTORS ON CILIARY ACTIVITY AND MUCUS TRANSPORT. *(Influence des facteurs de l environnement sur l activite ciliaire et le transport du mucus). Text in French. Bull. Physio Pathol. Respir. (Nancy), 9(2):377-393, March-April 1973. 22 refs.*

The effects of numerous environmental factors, physiological or atmospheric, have been studied either on tracheal mucus drainage in vivo, or, more frequently, on ciliary activity in vitro. The use of a precise method for measuring the frequency of ciliary movement has established the relationship between ciliary activity and temperature. It has also shown that ciliary activity is unaffected by variations of oxygen pressure from 7 to 3000 torr, but that it is significantly reduced when the carbon dioxide pressure exceeds 35 torr. In addition, ciliary movement is extremely sensitive to pH. An acid pH is inhibitory whereas an alkaline pH up to pH 10 exerts an activating effect. Contrary to what has been suggested previously, the frequency of ciliary beating is unaffected by unipolar atmospheric ionization. However, it is extremely sensitive to irritant pollutants, in particular sulfur dioxide, nitrogen dioxide, chlorine, short-chain aldehydes, and hydrocyanic acid. A number of these substances are present in high concentrations in the gaseous phase of cigarette smoke and may explain in part the toxic action of this smoke on mucociliary function. The particulate phase of cigarette smoke also carries a number of ciliary inhibitors. The quantitative study of all these factors provides valuable information about the etiology of a number of diseases of the ventilatory system.

31308 APTIC NO. 52789

Hirata, Kinitsu

THE CONSTITUTION AND HEALTH OF CHILDREN IN A POLLUTED ENVIRONMENT. *(Kogai kankyoka no kodomo no taikaku tairyoku). Text in Japanese. Taiiku no Kagaku (J. Health, Phys. Educ., Res.), 23(6):382-386, 1973. 3 refs.*

Using a specially designed and computarized health evaluation method, the constitution and health of the Japanese children for the past 10 years, but especially for 1970, 1971, and 1972 are reviewed. The data for more than 250,000 schoolchildren show that the average height is gradually increasing, and the weight and chest measurements are gradually decreasing. Athletic abilities of the children were tested with a 50 m run, a standing jump, and soft ball throwing. The abilities showed a gradual deterioration over the years, especially in the jumping capacity. Excellent health specimens and muscular bodies have decreased considerably, and generally frail, unhealthy, and fat children have increased in number. In general, large and medium cities produce tall and weak children, especially in busy commercial areas and residential areas. Children from agricultural or mountain villages tend to be much healthier, stocky and short, muscular, and strong. The amount of traffic on roads leading to school seemed to contribute to the frailty of the children in direct proportion. However, the more distance they had to walk to school, the healthier they were. The health of children in factory environments, either at school or home, was extremely poor. But the effects of the noise of automobiles and airplanes and exhaust gases were not clearly indicated. The children living or going to school in industrial areas with high concentrations of smoke and soot had small chest measurements, limited amounts of energy, and poor standing jump ability.

31309 APTIC NO. 53189

Hirst, Russell N., Jr., H. Mitchell Perry, Jr., Marcos G. Cruz, and John A. Pierce

ELEVATED CADMIUM CONCENTRATION IN EMPHYSEMATOUS LUNGS. *Am. Rev. Respirat. Disease, 108(1):30-39, July 1973. 18 refs. (Presented at the Conference on Trace Substances in Environmental Health 6th Annual, Columbia, Mo., June 1972.)*

Tissues from subjects with severe emphysema were compared for metal content with those of age-matched control subjects. Emphysema was quantitated by the standard panel method. Cadmium and zinc concentrations were determined in the kidney, lung, and liver tissues of all subjects. Concentrations of calcium, lead, potassium, and sodium were also measured. The cadmium concentrations were significantly greater in the tissues from the emphysematous group, whereas concentrations of zinc and other metals did not differ between the groups. The differences in cadmium concentrations were greatest in the lung. It seemed probable that the pulmonary cadmium came from cigarette smoke, although it should not be concluded that cadmium caused the emphysema. (Author abstract)

31310 APTIC NO. 52685

Horiguchi, Shunichi

INTOXICATION BY LEAD. *(Namari chudoku). Text in Japanese. Gendai Igaku (Curr. Med.), 20(3):291-297, March 1973. 16 refs.*

The increased emission of lead into the atmosphere because of automobile exhausts has caused concern because of the toxic properties of lead. The increased lead content in the arctic is comparable to the increased consumption of gasoline containing tetraethyl lead. Osaka city air contains 3-30 micrograms/cu m of lead. Air inside factories can often contain 7-2230 micrograms/cu m of lead. Human accumulation of lead may amount to 80 mg in the life span of a typical Japanese. Lead poisoning symptoms include anemic, neuropathic, and gastroenterologic symptoms. Lead hinders the synthesis of hemoglobin and causes hemolysis. Anemic symptoms such as increase of urinary coproporphyrin, increase of delta-aminolevulinic acid, and decrease of erythrocyte delta-aminolevulinic acid dehydrogenase are used as indicators of lead exposure. Brain disease and paralysis caused by lead poisoning rarely occur. However, lead workers sometimes have neurological disfunction. Gastroenterologic symptoms are connected to the changes in the autonomic nervous system. Lead also affects the liver, kidney, circulatory system, reproduction system, and motor system.

31311 APTIC NO. 53244

Hosokawa, K.

AIR POLLUTIONS AND ITS INFLUENCE IN HIROSHIMA PREFECTURE, (D) RESULTS OF THE EXAMINATION IN FUKUYAMA CITY, 1971. *(Hiroshima-ken ni okeru taiki osen to sono eikyo, D. Fukuyama-shi ni okeru kenshin seiseki- showa 46 nendo). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), 26(7):880-886, 1973. 3 refs.*

Fukuyama inhabitants were studied for the effects of air pollution by questionnaires, pulmonary function tests, determinations of body height and blood pressure, urinalyses, X-rays, and subjective symptoms. Morbidity of cough, sputum, gasping, rhinitis, bronchitis, and other respiratory symptoms was high. Morbidities of symptoms closely connected with the diagnosis of chronic bronchitis were higher than those in 1970. Increased complaints were made of tearing, sneezing, and eye irritation. The respiratory disease morbidity was higher in smokers and increased as the amount of cigarettes consumed increased. The effects of smoking were often greater than the effects of pollution.

31312 APTIC NO. 52793

Hosokawa, Sumi

REGIONAL HEALTH - AN INVESTIGATION INTO ASTHMA OF ELEMENTARY SCHOOLCHILDREN IN THE CITY OF FUKUYAMA, (NO.1). *(Chiiki hoken, Fukuyama shinai shogakko jido no zensoku chosa ni tsuite, dai 1-shu). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), 26(4):464-470, April 1973. 5 refs.*

The total fourth graders of three elementary schools in Fukuyama were given a questionnaire. Those suspected to have asthma were given a second questionnaire and then those still suspected to have asthma were given a detailed health examination. Almost 100% of 345 children responded to the first questionnaire, of which 56 children were given the secondary questionnaire. Twenty-nine children were then given health examinations, and four children were found to have asthma. The rates of morbidity were 2.3% in one school, 0.5% in another, and zero in the third school. Examinations were given on wheezing, breathing difficulty, past health records, allergy, family health records, living environment, physical development, chest X-ray, red blood sedimentation, and simple lung function. The family health record and the past health record seemed to be related with the morbidity of the children. Allergic children were made more susceptible by air pollution and had recurrence of asthma. This fact was suggested especially by the briefness of their stay in the area. However, generally, air pollution seemed not to have affected the health of schoolchildren in Fukuyama.

31313 APTIC NO. 52890

Ichinosawa, Akio and Hajime Yamabayashi

AIR POLLUTION. *(Taiki osen). Text in Japanese. Gendai Iryo (Mod. Med. Treat.), 5(2):307-312, May 1973. 16 refs.*

Various ways of examining airway disorders, which are not usually detected by the previously known methods, are reviewed. The most accurate method would be the measurement of airway resistance, but the use of the body plethysmography for a large number of people for epidemiological studies would not be practical. The oscillation method of measuring breathing resistance can measure airway resistance and respiratory resistance in a short time. The flow-volume curve is also used. The effect of smoking shows the closing volume change of small airways, which suggests the early effects of air pollution on small airways. When a small airway disorder occurs, the static compliance is normal, but the dynamic compliance decreases as the inhalation increases. The main disorder in the alveoli by air pollution is emphysema with alveolar destruction. The cause could be direct contact with the pollutants, or could be indirect contact with pollutants like sulfur dioxide, which is absorbed in the upper airway and affects alveoli through the blood vessels. The effects of nitrogen dioxide are also discussed.

31314 APTIC NO. 52782

Ishida, Bunta and Sumie Ishida

A STATISTICAL STUDY ON RESPIRATORY DISEASE AMONG SCHOOL CHILDREN IN ODAWARA CITY. *(Odawara-shi ni okeru gakudo no kokyuki shikkan ni kansuru anketo chosa). Text in Japanese. Shoni Hoken Kenkyu (J. Child Health), 31(6):257-260, 1973. 2 refs.*

The respiratory diseases of elementary school pupils of Odawara were investigated by a questionnaire given to their parents in Nov. 1968. Of the total of 11,265 children, 93.8% responded. Morbidities of the first through third graders and the fourth through the six graders were compared. The upper class children had colds once or twice a year, but recurrence of three to six colds was frequent among the lower graders; the difference was significant. The lower graders had significantly more coughing and prolonged coughs for one to three months. The lower graders had a high rate of wheezing and continuous wheezing for 1-3 months. The morbidity of bronchitis among the lower graders was 7.9% and among the upper graders was 6.4%. Asthmatic symptoms were 6% among the lower graders and 3.6% among the upper graders. Geographically, the congested commercial and residential area in the old city limits had a high rate of wheezing, asthmatic symptoms, and prolonged colds compared to the children from the city new limits which includes agricultural areas.

31315 APTIC NO. 53235

Ishida, Sei

COUNTERMEASURES OF AIR POLLUTION BY NITROGEN OXIDES. *(Chisso sanka butsu no taiki osen taisaku). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 2(7):468-484, July 1973*

The effects of nitric oxide and nitrogen dioxide on humans and animals are discussed. Extremely concentrated NO causes paralysis and convulsion due to disturbance of the central nervous system. Its affinity to hemoglobin is a few hundred times that of varbon monoxide. Nitrogen dioxide penetrates deeply into the respiratory system and increases airway resistance in the presence of floating dust due to its additive action. The odor threshold of NO2 is 0.12 ppm; the value is less in the presence of sulfur dioxide. At 16.9 ppm, significant increase of airway resistance appears for 10 min. During animal experiments, 0.5 ppm for 4 hr caused effects to the lung cells; several months exposure to 0.5 ppm caused bronchiolitis and pulmonary emphysema; exposure to NO2 also caused increased susceptibility to infectious diseases from bacteria, shortening of life span, and decreased immunity to bacteria. Increased morbidity to influenza occurred in children exposed to 0.062-0.109 ppm of NO2 with more than 2.8 micrograms/cu m of floating nitrate and almost no SO2. Chronic bronchitis morbidity was more than 5% in areas of Tokyo where the 24-hour average SO2 concentration was less than 0.05 ppm, compared to 3% in the unpolluted area. In Tokyo, the NO2 concentration (yearly 24-hour average) was more than 0.042 ppm

There was a high correlation between cough and sputum and NO2 concentration in one study. Where the morbidity was over 4%, the 1-hour average NO2 concentration was 0.042 ppm. Air quality standards and criteria for nitrogen oxides are mentioned.

31316 **APTIC NO. 52784**

Izawa, Tadasu, Atsuta Yutaka, Nobuhiko Sakano, Hitoshi Kamiya, Toshi Uemura, Masahiko Ishii, Kozo Okumura, Hideaki Ban, Toshiaki Iwasa, Akihiko Hattori, and Fumiko Okada

AIR POLLUTION AND THE BRONCHIAL ASTHMA OF CHILDREN. *(Taiki osen to shoni no kikanshi zensoku). Text in Japanese. Shonika (Pediatrics), 14(8):685-693, 1973. 16 refs.*

The respiratory diseases of children in Yokkaichi in relation to air pollution were studied. The morbidity of children in 1970 investigated by a questionnaire was 1.64% for boys and 0.98% for girls in polluted areas, and 0.96% for boys and 0.41% for girls in nonpolluted areas. Junior high school boys in polluted areas had a higher morbidity than girls or residents of nonpolluted areas, but on the whole, there was no significant difference between polluted and nonpolluted areas. As of Dec. 1972, officially recognized air pollution victims in Yokkaichi were 924, among which 40.5% or 374 were less than 15 years of age. Close to a half of them had asthmatic bronchitis, 28.9% bronchial asthma, and 22.7% chronic bronchitis. Among the infants, asthmatic bronchitis cases were 70.5% of all respiratory cases. Asthmatic bronchitis morbidity among elementary schoolchildren was 36.0%, and among junior high schoolchildren was 11.8%; this is still too high for these age groups, but it is suspected that these cases are different from the asthmatic bronchitis of infants. Approximately 50% of schoolchildren recognized as air pollution victims came from the two most polluted schools, and morbidity for chronic congestive respiratory diseases in these schools was 5.93 and 5.59%. The ratio of boys to girls was 1.6, and it is clear that boys, especially among the younger children, were more susceptible to pollution. Absenteeism in the polluted area was 0.87%, and in nonpolluted area was 0.53%. Morbidity of lung, nose, eye diseases, health examination of schoolchildren, clinical and statistical studies of young children, seasonal trends, attack rates, meteorological effects, blood analyses, and allergy studies are discussed.

31317 **APTIC NO. 53190**

Jarvis, J. A. E. and L. Magos

EFFECTS OF PHENOBARBITONE AND STARVING ON THE DOPAMINE CONTENT OF THE ADRENAL GLANDS OF RATS EXPOSED TO CARBON DISULFIDE. *Naunyn-Schmiedebergs Arch. Pharmacol., 278(2):20. 213, 1973. 16 refs.*

The effects of phenobarbitone and starving on the dopamine content of the adrenal glands of rats exposed to carbon disulfide were investigated. Two 4-hour inhalation exposures of male rats to 2.0 mg/l of carbon disulfide given on consecutive days increased the dopamine (DA) content of the adrenal gland by 100%. In rats treated with phenobarbitone (Phb) or starved before exposure, the increase in adrenal DA was significantly higher. The highest DA content in adrenal glands was found in starved phenobarbitone pretreated rats after carbon disulfide exposure. Starvation and/or phenobarbitone without carbon disulfide exposure caused no increase in adrenal DA. (Author abstract)

31318 **APTIC NO. 53569**

Jegier, Z.

OZONE AS AN AIR POLLUTANT. *(L ozone en tant que polluant atmospherique). Text in French. Can. J. Public Health (Toronto), 64(2):161-166, March/April 1973. 21 refs.*

The biological effects of long term exposure to a low concentration of ozone were investigated by exposing rabbits to 0.4 ppm for 6 hr/day, 5 days/wk, for a calendar period of 10 mo. A longitudinal study of the serum protein esterase of the exposed and control animals showed that its concentration was slowly, but steadily rising. Microscopic studies carried out on the sacrificed animals showed both emphysematous and vascular lesions were present in the lungs of the exposed rabbits. Small pulmonary arteries (exterior diameters of 105 micron to 1050 micron) showed a marked mural thickening. Long term exposure to a low concentration of O3 may be detrimental to blood vessel tissues. (Author abstract modified)

31319 **APTIC NO. 52864**

Johnston, J. R. and D. C. F. Muir

INERTIAL DEPOSITION OF PARTICLES IN THE LUNG. *Aerosol Sci., vol. 4:269-270, 1973. 6 refs.*

An error in the reported relationship of impaction efficiency to the Stokes number has led to incorrect estimates of particle deposition in the human lung. It is likely that there will now be a shift to smaller sizes in the calculated size distribution of particles which are able to penetrate to the alveoli when a nonhomogeneous aerosol is inhaled.

31320 **APTIC NO. 53173**

Kabayama, Hisao, Koichi Suzuki, and Yuriko Ishizaki

OCULAR SYMPTOMS OF AIR POLLUTION VICTIMS OF SHAKUJII MINAMI JUNIOR HIGH SCHOOL, TOKYO. *EPI Environ. Prot. Ind., 4(2):4-7, March/April 1973.*

Results of eye examinations necessitated by air pollution-related mass injuries which occurred from May through July 1972 among students attending Shakujii Minami Junior High School in Tokyo revealed that eye involvement generally appeared subjectively as eye pain, epiphora, sensitivity to light, and itching; objectively, it appeared as simple conjunctivitis or superficial keratoconjunctivitis. The prognosis of ocular involvement was satisfactory, with minor symptoms usually disappearing within 24 hours. Cases with severe symptoms resulting from concentrated pollution or those with superficial keratoconjunctival turbidity required more than a week to recover. No significant decrease in visual acuity was exhibited in any of the cases. The ocular fundus appeared normal in the majority of the cases, while those with severe systemic involvement showed slight retinal arterial spasms. Psychogenic factors were concluded to have played a significant part in the injuries. Tubular centripetal visual field constriction was observed in two females with repeated systemic symptoms. Many cases exhibited subjective symptoms such as general loss of strength, decrease in visual acuity, and eye pain similar to a psychophysiological reaction; such symptoms persisted for a comparatively longer period of time. The results of tests of blood chemistry, urine chemistry, and pulmonary function are also given. (Author conclusions modified)

31321 **APTIC NO. 53253**

Katsuta, Shizutomo

INFLUENCE OF AIR POLLUTION ON RESPIRATORY SYSTEM, A, REVIEWED FROM INTERNAL MEDICINE. *(Taiki osen no seitai ni oyobosu eikyo, A. Naika no tachiba yori). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), 26(7):850-853, 1973. 10 refs.*

Dusts, stimulating substances, and carcinogens are described. Dusts cause occupational diseases such as pneumoconiosis and pulmonary fibrosis. Stimulating components such as sulfur dioxide first cause inflammation and obstructure of the airways. Long exposure to such substances cause chronic disease such as bronchitis, bronchial asthma, pulmonary emphysema, and pulmonary fibrosis. Carcinogens such as 3,4-benzopyrene may cause lung or other types of cancer. The effect of smoking on the respiratory system is similar to the effect of pollution.

31322 **APTIC NO. 53239**

Kawabata, Isuzu, B. Satake, and H. Ishii

POLLENS AS THE CAUSE OF POLLENOSIS, SEEN BY SCANNING ELECTRON MICROSCOPE, PART II. POLLEN OF CRYPTOMERIA. *(Sosa denshi kenbikyo no sekai 147 - kafunsho no genin to naru kafun, 2. sugi no kafun). Text in Japanese. Igaku no Ayumi (Progr. Med.), 85(7):A-371-A-372, May 1973.*

The cryptomeria japonica is a plant uniquely growing in every region of Japan except Hokkaido. During its flowering period from February to April, it scatters the largest number of pollens of any plant except pines (pinus densiflora). These pollens cause hayfever and pollenosis (allergy to pollens). Photograms of the pollens made by scanning electron microscopy are given.

31323 **APTIC NO. 53240**

Kawabata, Isuzu, B. Satake, and H. Ishii

POLLENS AS THE CAUSE OF POLLENOSIS, SEEN BY SCANNING ELECTRON MICROSCOPE, PART I. POLLEN OF PINE. *(Sosa denshi kenbikyo no sekai 146 - kafunsho no genin to naru kafun, 1. matsu no kafun). Text in Japanese. Igaku no Ayumi (Progr. Med.), 85(6):A-369-A-370, May 1973.*

Allergies to pollen (pollenosis) cause symptoms such as watery eyes, sneezes, and asthma. Pollens are produced in large quantity and are carried by the wind to remote places. Photograms are given of pine tree (pinus densiflora) pollens which cause positive reaction to patients with nasal allergies. The morphology of these pollens can play an important role in making the investigation of nasal allergies accurate and easy.

31324 **APTIC NO. 53241**

Kawabata, Isuzu, B. Satake, and H. Ishii

POLLENS AS THE CAUSE OF POLLENOSIS, SEEN BY SCANNING ELECTRON MICROSCOPE. *(Kafun-sho kafun no sosa denken zo). Text in Japanese. Jibi to Rinsho (Clin. Otolaryngol.), 19(4):562-563, 1973.*

Five photograms taken by scanning electron microscopy are given of pollens which cause pollenosis (allergy to pollens). All pollens are enlarged 800 times. Plants produce pollens which are scattered by the wind and which cause allergies, including pollenosis.

31325 **APTIC NO. 53052**

Kilroe-Smith, T. A. and G. M. Oxenham

THE EFFECT OF SILICA DUST ON THE PHOSPHOLIPID METABOLISM OF MACROPHAGES. *Chem.-Biol. Interactions (Amsterdam), 6(6):367-373, June 1973. 22 refs.*

The effect of silica dust (quartz dust) on the phospholipid metabolism of guinea pig macrophages was investigated. A slight decrease occurred in lecithin content of macrophages incubated with tridymite for 24 hr at 37 deg. This same phenomenon was observed when macrophages were incubated at 45 deg. The experimental materials and methods are presented and described. Results are discussed. The decrease of lecithin concentration in macrophages incubated with quartz dust is a nonspecific phenomenon associated with cell death. The implications are considered with respect to silicotic lesions. (Author abstract)

31326 **APTIC NO. 52785**

Kondo, Eizo

THE PRESENT SITUATION OF PHOTOCHEMICAL SMOG, ITS DAMAGES, AND COUNTERPLANS. *(Kokagaku sumoggu no genjo to higai oyobi sono taisaku). Text in Japanese. Taiiku no Kagaku (J. Health, Phys. Educ., Res.), 23(6):357-360, 1973.*

Health damage incidents by photochemical smog reported between April 29 and October 20, 1972 in Tokyo were 8437, of which 5415 were children. The total number of reports in Tokyo for 1970 was 10,064, involving 6024 children, and for 1971 28,223, involving 14,982 children. The number of incidents seemed to have declined for 1972, but the degree of symptoms and damages were not clearly indicative. The guiding instructions issued by the Tokyo Metropolitan Bureau of Education to all schools include the following: an emergency operation system with individual duties clearly designated; a daily operation team, an emergency treatment team, and a liaison team should be trained for all situations; the children s health should be carefully observed in the first hour of the classes every day; teachers should be thoroughly familiar with the symptoms of photochemical smog victims, and when there is a danger of smog, these symptoms should be watched for; school doctors should be consulted for any extraordinary complaint by children; when children show clear signs of the effects of photochemical smogs in the light of their daily health, the amount of sleep on the previous day, and the amount of breakfast and exercises, the cases should be reported to the Tokyo Metropolitan Government; swimming coaching should be given based on a thorough observation of individual health condition; athletic meets and rehearsals should be conducted with a special care for the children s health; and all the exercises should be interrupted when a smog warning is issued.

31327 **APTIC NO. 52869**

Koshal, Rajindar and Manjulika Koshal

ENVIRONMENTS AND URBAN MORTALITY--AN ECONOMETRIC APPROACH. *Environ. Pollut., 4(4):247-259, June 1973. 13 refs.*

A quantitative relation between total mortality rates from all diseases (40 U. S. cities, 1960-1967) and the level of air pollution and other socio-economic variables was established by means of a macro-model. Regression analysis indicated that a 10% increase in air pollution would be accompanied by a 1.2-1.9% increase in total mortality rates due to various diseases. An overall reduction of 50% in air pollution would reduce the total mortality by 6-9.6%. Assuming a similar relation for mortality and morbidity with air pollution, a 50% improvement in air quality would imply a social savings of $3400-5400 million/yr in terms of all diseases. In addition to the economic costs of diseases, $10,100 million/yr are lost through damage to vegetation, materials, and property. Thus the benefits of air pollution abatement are far greater than the costs ($4700 million in 1975). (Author abstract modified)

31328 **APTIC NO. 53440**

Lytle, C. D., S. G. Benane, and L. E. Bockstahler

ULTRAVIOLET-ENHANCED REACTIVATION OF HERPES VIRUS IN HUMAN CELLS. *Preprint, Food and Drug Administration, Rockville, Md., Div. of Biological Effects and Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, 15p., 1973. 10 refs.*

The ultraviolet (UV) reactivation (increased susceptibility to infection of ultraviolet irradiated herpes complex virus) of three types of human cell cultures was studied. The cell types studied were: Hela (a human tumor cell line); Hela (HVJ), a Sendai virus carrier culture of Hela cells; and human embryonic lung cells. A germicidal lamp was used as the source of UV light. The reactivation was observed in Hela and Hela (HVJ), but not in the embryonic lung cells. Since the Hela and lung cells have similar levels of host cell reactivation, the expression of UV reactivation is apparently not directly related to the capacity for host cell reactivation. Since reactivation has also been demonstrated in monkey kidney cells and rat mamary tumor cells, but not in rat embryo cultures, it appears that long term in vitro mammalian cell cultures may have reactivation capacity, while primary or secondary cultures of normal cells may not. It also appears that the survival of the capacity of a human cell to support herpes virus growth is directly related to its ability to repair UV damage as measured by cell survival or host cell reactivation. The UV reactivation occurred as an increase in the reactivation ability of the individual cells. Thus, the reactivation is a cellular phenomenon in mammalian cells, rather than a change in the population of cells expressing second component host cell reactivation. In human cultures, the expression of reactivation upon immediate infection was irradiated virus continues at least 24 hours after cell irradiation and may even increase in amount (delayed UV reactivation).

31329 **APTIC NO. 52822**

Manton, W. I.

SIGNIFICANCE OF LEAD ISOTOPE COMPOSITION IN BLOOD. *Nature (London), 244(5412):165-167, July 20, 1973. 9 refs.*

Lead isotope ratios and lead concentrations were determined in the blood of 10 male Dallas residents who lived at least 10 miles from lead smelters. The isotope ratios of seven subjects formed a broad group distinct from those of airborne particulate matter. Two foreign-born subjects had different ratios, suggesting that blood isotope ratios reflect past, and not present, exposure and respond slowly to changes in isotope ratios of ingested lead. Differences in isotope ratios between the foreign-born subjects and their American wives appeared to reflect different exposures to lead before marriage. These results indicate that lead in blood continuously mixes with a large reservoir of lead elsewhere in the body, presumably in the skeleton. Lead isotope ratios in blood should be representative of the lead to which an individual has been exposed, irrespective of any exchange of isotopes in the skeleton.

31330 **APTIC NO. 53266**

Masse, Roland, Paul Fritsch, Roger Ducousso, Jacques Lafuma, and Jacques Chretien

PARTICLE RETENTION AT THE BRONCHIAL CELL LEVEL AND POSSIBLE RELATIONSHIPS WITH THE INHALED CARCINOGENS. *(Retention de particules dans les cellules bronchiques, relations possibles avec les carcinogenes inhales) Text in French. C.R. Acad. Sci. (Paris), Sec. D, 276(21):2923-2925, May 21, 1973. 11 refs.*

A possible carcinogenic relationship is demonstrated between inhaled air contaminants and their deposit in the lungs of animals. Powdered tantalum was used in one study in which five Wistar rats, two cats, and three Macaque monkeys were exposed to the inhalation of this powder. In another study, a baboon was subjected to the inhalation of finely divided hematite. The lungs were examined histologically 10 days later. Mineral particles were found in considerable quantities in the bronchial cells of the monkey following the inhalation of tantalum powder. Such particles were also found in the rat lung, and to a lesser degree, in the cat lung. Hematite particles were likewise found in the bronchial cells of the monkey, in this case in the ciliated epithelial cells and in the basal cells. The presence of the intracellular particles was closely related to bronchial retention. It is suggested that certain species, namely primates, are more susceptible to bronchial carcinogens, than other species.

31331 **APTIC NO. 52783**

Matsumura, Tadaki, Yoshimasa Sakamoto, Moroko Iwase, Ryoji Ebina, Masahito Koyama, Kenya Nishioka, Makoto Sugiyama, Kazuko Takeoka, Jiro Yonei, Yoshihiko Nomura, Michiko Shitagawa, Takako Kubo, Yasuko Ueno, and Yasuko Kawai

THE CLINICAL DIAGNOSIS OF DAMAGE DUE TO PHOTOCHEMICAL SMOG OCCURRING IN THE CITY OF MORIGUCHI. *(Moriguchi-shi ni oite hassei shita kokagaku sumoggu ni yoru to omowareru higai no rinsho). Text in Japanese. Nippon Rinsho (Japan Clin.), 31(6):154-168, June 1973. 16 refs.*

The photochemical smog episode of the Moriguchi Junior High School in October 1972 was investigated by clinical examinations and questionnaires. Twenty-four pupils out of the total 280 who were exercising in the playground at that time were affected to the extent of hospitalization. The weather was good with slight breezes, and the oxidant concentration in Osaka was more than 0.1 ppm, but was only 0.09 ppm in Moriguchi and photochemical smog warning had not been issued. Blood gas analyses showed extraordinary pH, PaCO2, and HCO3, and acute alkalosis was noted. The symptoms agreed with the previously recorded acute hypocapnea significance band and hyperventilation syndrome. Leucocytosis with neutrophilia were noted, but the symptoms disappeared the next day. Serum protein division, serum electrolysis, GOT, GPT, Blood sugar, alkali phosphatase were all normal. The questionnaire responses showed that the frequency and degree of total body symptoms had a correlation with oxygen demand. Of the 171 pupils who had some kind of symptoms, 86 had localized symptoms. These could be regarded as some type of irritation of membranes by oxidants. The total body symptoms were the hyperventilation syndrome plus psychological reaction. With these case studies, a clear relationship between the total body symptom and oxygen demand was observed. The brain waves showed disorders observed in the total body symptoms of hyperventilation; but in these studies, a clear impression was obtained that the brain disorders were independent of the body reactions.

31332 **APTIC NO. 53254**

Matsushima, A.

INFLUENCE OF AIR POLLUTION ON LIVING BODIES, B, REVIEWED FROM OTORHINOLARYNGOLOGY. *(Taiki osen no seitai ni oyobosu eikyo, B. Jibi-ka no tachiba yori). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), 26(7):854-857, 1973. 6 refs.*

The influence of air pollution on airways was studied using results of an otorhinolaryngological investigation of 82 chronic bronchitis cases. The relationship between respiratory diseases such as sinusitis, laryngitis, nasopharyngitis, pharyngitis, and chronic bronchitis and X-rays was studied. Morbidities of 87.8%, 56%, 52.4%, and 48.7%, respectively, occurred of chronic pharyngitis, chronic paranasal sinusitis, chronic rhinitis, and chronic nasopharyngitis. Bronchial disturbance can affect the upper airway mucosa and make the mucosa more susceptible to air pollution. Paranasal sinusitis can be the cause of bronchial disturbances can affect the bronchus by making the bronchial mucosa more susceptible to air pollution. Bacteria in nasopharyngeal secretion and sputum showed that in chronic bronchitis the bacteria in sputum can contaminate the nasopharynx with a cough. Latent inflammation of airways could cause further disease when air pollution inhalation continues for a long period at low concentrations.

31333 **APTIC NO. 53502**

Mersch, John, Barbara J. Dyce, Bernard J. Haverback, and Russell P. Sherwin

DIPHOSPHOGLYCERATE CONTENT OF RED BLOOD CELLS. *Arch Environ. Health, 27(2):94-95, Aug. 1973. 5 refs.*

Preliminary testing of eight guinea pigs for the D-2,3-diphosphoglycerate (2,3-DPG) content of red blood cells showed a significant increase (P less than .05) for the four animals exposed continuously to 0.36 ppm nitrogen dioxide for 1 wk. Mean 2,3-DPG levels were 21-32.2 micromol in exposed animals compared with 16.5-20.4 micromol in control animals. The simplified assay used for 2,3-DPG determination involved precipitating the protein component of centrifuged and hemolyzed red blood cells with trichloracetic acid. The filtrate was then adsorbed with charcoal and tested for 2,3-DPG phosphorus by a colorimetric assay based on the blue color of a molybdenum compound.

31334 **APTIC NO. 53156**

Morgenroth, K.

CELLULAR REACTIONS IN THE HUMAN LUNG CAUSED BY INHALATION OF ASBESTOS DUST OVER LUNG PERIODS. *Beitr. Pathol., 148(2):199-210, 1973. 5 refs.*

Lung biopsy material from a worker exposed to asbestos dust was examined by light and electron microscopy. A reconstruction of the cellular reaction to inhaled asbestos was possible by observing the various morphological states under the electron microscope. Small asbestos particles are phagocytized by macrophages and embedded in phagostomes in the cytoplasms. Large asbestos particles, coated or uncoated, are present in the alveoli and in the connective tissue septa. Groups of alveolar macrophages surround the asbestos particles and may engulf them. The macrophages come into close contact with the particles; the asbestos is dissolved in lacunae appearing in the cellular membrane of the macrophages.

31335 **APTIC NO. 52796**

Nakamoto, Akiyoshi and Hidenori Dodo

INVESTIGATION OF CHILDREN SUFFERING FROM ASTHMA IN HIROSHIMA CITY. *(Hiroshima shinai shogakko no zensoku jido chosa ni tsuite). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), 26(5):590-595, May 1973. 2 refs.*

Children of all elementary schools in Hiroshima and some pupils of junior high schools were given a health examination by a questionnaire, a secondary screening by interview, and a detailed health examination. A considerably high morbidity of bronchial asthma was found. The questionnaire was given to 41,370 elementary schoolchildren and 761 junior high school pupils, of whom, 387 children from elementary school and 20 children from junior high school were given the final health examination. The rate of bronchial asthma among elementary schoolchildren was 2.41% (998), which compared with heavily polluted schools in Fuji city (2.01%). In control areas, the rate was 0.9%. Pollution by industrial emissions in Hiroshima is lower than in other industrial cities, but automotive exhaust gas pollution is as heavy as in other major cities. High morbidity was found in most schools facing highways with heavy traffic. Morbidity of bronchial asthmatic children in junior high schools was 1.45%, which seemed extremely high by any standard for children of the same age group. Morbidity was extremely high up to the third grade, especially among boys. Boys had high morbidity in junior high schools. The rate of major allergy cases in close family members was 65.4% in elementary schools and 58.3% in junior high schools. Asthmatic cases in a family were 41.7% in elementary schoolchildren and 33.3% in junior high school pupils. Personal allergy history occurred among 68.2% elementary schoolchildren and among 75% junior high school pupils.

31336 **APTIC NO. 53245**

Nakamoto, A.

AIR POLLUTION AND ITS INFLUENCE IN HIROSHIMA PREFECTURE E. RESULTS OF THE EXAMINATION IN HIROSHIMA CITY. 1971. *(Hiroshima-ken ni okeru taiki osen to sono eikyo, E. Hiroshima shi ni okeru kenshin seiseki). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), 26(7):887-890, 1973. 5 refs.*

In 1969 and 1970, respectively, air pollution concentrations in Hiroshima were 7.28 and 7.07 tons of dust/sq km/mo and 0.27 and 0.20 mg sulfur dioxide/100 cu m/day, compared to dust concentrations of 12-40 tons/sq km/mo in average industrial cities. In Yoshijima which contains a refuse-burning plant, dust concentrations were 12.5-13.3 tons/sq km/mo. The effect of air pollution was studied in Yoshijima on children born since 1959 and women over 40 years old with no smoking or occupational exposure. Children had increased amounts of asthmatic bronchitis and asthma as a result of dust. Women tested by questionnaire, X-ray, pulmonary function test, electrocardiogram, blood pressure test, blood and urine analyses, and body height and weight measurements showed only a significant difference in sputum which continued for more than 3 months and in rhinitis. Inhabitants in the Yoshijima area were more affected by air pollution than inhabitants of other areas of Hiroshima.

31337 **APTIC NO. 53246**

Nakamoto, A. and S. Katsuta

MEDICAL INVESTIGATION OF THE INFLUENCE OF AIR POLLUTION IN YOSHIJIMA AREA, HIROSHIMA CITY.--ON THE RESULTS OF HEALTH EXAMINATION ON ADULT INHABITANTS, 1972. *(Hiroshima-shi Yoshijima chiku ni okeru taikiosen no eikyo ni kansuru igakuteki chosa -Showa 47 nendo seijinkenko chosa seiseki ni tsuite-). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), 26(7):891-896, 1973. 4 refs.*

The effects of air pollution on the inhabitants of the Yoshijima area of Hiroshima city were compared to the effects on inhabitants of seven other areas of the same city in 1972. Inhabitants were given questionnaires, X-rays, pulmonary function tests, electrocardiograms, blood pressure test, blood and urine examinations, and body height and weight measurements. No significant differences were found in subjective symptoms such as cough and sputum. More sputum occurred in the Yoshijima area and one other area. Abnormal X-rays occurred with the second highest percentage in Yoshijima. Yoshijima inhabitants had the highest decreased vital capacity. Increased pulmonary obstruction shown by decreased forced expiratory volume was not highest in Yoshijima. The abnormal ECG rate was highest in Yoshijima. No differences were found in blood and urine values. Generally, no noticeable differences were found in the investigation results in Yoshijima due to decreased dust and sulfur dioxide concentrations in the area. Dust concentrations were 13.31, 12.53, 9.44 and 7.29 tons/sq km/mo and sulfur dioxide concentrations were 0.26, 0.20, 0.16, and 0.107 mg/100 cu m/day, respectively, in 1969, 1970, 1971, and 1972.

31338 **APTIC NO. 52770**

Nishikawa, Shinhachi

AIR POLLUTION AND RESPIRATORY DISEASES. *(Taiki osen to kokyuki shikkan). Text in Japanese. Rinsho to Kenkyu (Japan. J. Clin. Exper. Med.), 50(7):1946-1953, 1973.*

Air pollution damages, the effects on the human life, the history of air pollution, the present pollution conditions in Japan, pollutants and health hazards, and diagnosis of pollution hazards are discussed. In polluted areas, 30-40% of the schoolchildren complain of bad odors in the air, eye irritation, cough, sputum, discomfort in the throat, and disorders in the upper and lower air passages, compared to 10% at most in nonpolluted areas. the mortality of respiratory diseases and circulatory diseases in Kawasaki city were compared in polluted and nonpolluted areas between 1962 and 1965, and the mortality of respiratory patients in nonpolluted areas was significantly lower. Between December and March, the effects of air pollution is most strongly felt in Kawasaki, and morbidity of influenza, pharyngitis, flue, bronchitis, and pneumonia are unusually high during this period. In Hokkaido, the mortality of lung cancer patients rises when the concentration of 3,4-benzopyrene increases in the air. According to the data since 1970, the number of patients diagnosed as victims of air pollution has increased 10 times over in all Japan in 3 years. Morbidity is extremely high among infants, and 31% belong to the age range between 0 and 4 years, and 19% to 5 and 9 years old group. But mortality is much higher among the old people above 60 years old.

31339 APTIC NO. 53238

Nogawa, K., E. Kobayashi, and M. Sakamoto

STUDIES OF THE EFFECTS OF AIR POLLUTION CONSISTING OF DUSTS MAINLY COMPOSED OF MANGANESE TO THE RESPIRATORY SYSTEM. PART I. EFFECTS ON THE RESPIRATORY SYSTEM OF MIDDLE SCHOOL PUPILS. *(Mangan o shu to suru funjin ni yoru taiki osen no kokyuki ni oyobosu eikyo ni kansuru kenkyu-dai 1po- chugakusei no kokyuki eno eikyo). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 20(6):315-325, June 1973. 22 refs.*

Ferromanganese effects on the respiratory system of 9% of the middle school pupils in Kanazawa living within 500 m of a factory, 24% within 500-1000 m, 29% within 1000-1500 m, and 38% far from the factory were investigated. Questionnaires and tests of pulmonary ventilation, vital capacity, and peak flow rate were used to test the effects of the manganese. Manganese concentration 300 m from the factory was as much as 6.7 micrograms/cu (5-day average). Subjective respiratory symptoms were more frequent in the polluted area than in the control area. Pulmonary function values were lower in the polluted areas. The 1-second flow rate was lower in the polluted areas in proportion to the length of time the pupils lived in that area and to the distance from the factory. The 1-second flow rate correlated well with the manganese concentration in cedar trees and mud in house gutters. The subjective symptoms and lower ventilation functions were thus caused by air pollutants, including manganese, exhausted from the factory.

31340 APTIC NO. 52772

Oji, Kiichi

CLINICAL EXPERIENCE IN AN AIR POLLUTED AREA. *(Taiki osen chiku ni okeru rinsho keiken). Text in Japanese. Zennihon Byoin (All-Nippon Hosp.), no. 54:33-38, Aug. 1973. 3 refs.*

The Sakai Municipal Health Investigation Committee conducted a health examination in the most polluted area of the city in the winter of 1970. The total of 4043 residents above 40 years of age were examined, 8.75% had chronic bronchitis; this compared to 3.6% in 1964 when a similar test was given in the same area. The average sulfur dioxide concentration of the area was 0.06 0.07 ppm/mo. The chronic bronchitis morbidity showed correlations with SO2 concentration, settling particles, and fuel consumption of the city. Of the bronchial patients, 84 (11.3%) had obstructed lung function and 303 (16.2%) had shadows in the X-ray, most of which were tuberculosis; there were three tumors. In the photochemical incidents of August 27 and Sept. 2, 1971 in Sakai, 12 persons were hospitalized. Symptoms were pains in the throat and eye, numbness of the limbs, breathing difficulties, and hazy consciousness. The occurrences of these symptoms and the peaks of oxidant concentration coincided, and the peaks also coincided with the peaks of SO2 concentration. Most of these main symptoms disappeared in one or two hours. Of the examined patients, 10 had fevers, nine had inflamed pharynges, seven had inhalation difficulty, and some had flushed faces, palpitations, and numbness of the limbs. The blood pressure was normal for everyone, and so was the sedimentation of red blood, urinalysis, ASLO, CRP, Hb, Ht; but for nine patients, the number of leukocytes increased by more than 10,000 and lymphocytes decreased.

31341 APTIC NO. 53169

Oshima, Hidehiko, Masayuki Imai, Tokiko Kawagishi, and Kusuo Banno

AIR POLLUTION AND MORBIDITY IN YOKKAICHI AREA (2ND REPORT). *(Yokkaichi chiiki ni okeru taiki osen to rikanritsu ni tsuite (dainiho)). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 8(2):126-133, 1973. 17 refs.*

An investigation of the incidence of diseases in the Yokkaichi area through the use of National Health Insurance System records from April 1961 to March 1970 revealed a remarkable difference between polluted and non-polluted districts in the incidence of upper respiratory disease, common cold, bronchitis, bronchial asthma, asthmatic bronchitis, and a group of diseases affecting the front portion of the eye. The incidence of bronchial asthma had significant correlation to the sulfur dioxide level in 1964 but did not in 1970. Incidences of chronic bronchitis and emphysema were significantly correlated with the concentration of SO2 in the districts during 1970.

31342 APTIC NO. 52828

Pankow, D., K. Pfordte, and W. Ponsold

COMBINED EFFECTS OF CARBON TETRACHLORIDE AND CARBON MONOXIDE ON THE ACTIVITIES OF LEUCINE AMINOPEPTIDASE AND TRANSAMINASES IN PLASMA OF RATS. *Toxicol. Appl. Pharmacol., 25(2):310-313, June 1973. 24 refs.*

The influence of carbon tetrachloride and carbon monoxide on the activities of leucine aminopeptidase (LAP), glutamic-oxaloacetic transaminase (GOT), and glutamic-pyruvic transaminase (GPT) in the plasma of rats was investigated. The CO injected without CCl4 administration increased the LAP activity. The administered dose of CO produced no significant enhancement of transaminase activity. After combined administration of CCl4 and CO, the activities of LAP, GOT, and GPT were distinctly higher than the activities after administration of CCl4 alone.

31343 APTIC NO. 53570

Pasquis, P., A. M. Cevaer, Ph. Denis, M. F. Hellot, C. Pietrini, and R. Lefrancois

NORMAL VALUES OF TLCO MEASURED IN STEADY STATE. *(Valeurs normales du coefficient de transfert pulmonaire du co en etat stable). Text in French. Bull. Physio-Path. Respir. (Nancy), 9(3):553-568, May-June 1973. 26 refs.*

The steady state pulmonary carbon monoxide transfer (TLCO) was measured in 200 subjects aged between 6 and 74 years. The following relationships were established: between TLCO, height, and age for both sexes; variation in TLCO/FRC with age; and k prime as a function of age (by analogy with the permeability factor k in the apnoeic method, k prime is defined as equal to FRC + VTA/2 divied into TLCO (PB 47)). It is necessary to know the normal values for FRC as a function of age and height. These were calculated taking into account the FRC/TLC ratio determined in this study and the measurement of TLC according to the work of European Coal and Steel Community. The TLC/FRC ratio and k prime decrease with age. This decrease is more marked than the increase in FRC with age. This explains the decrease in TLCO with age for a given height. The relationships defined permit calculation of theoretical values for TLCO by the steady state method in a given subject and are of value in the interpretation of values obtained in patients.

31344 APTIC NO. 52792

Paulson, Olaf B., Hans-Henrik Parving, Jes Olesen, and Erik Skinhoj

INFLUENCE OF CARBON MONOXIDE AND OF HEMODILUTION ON CEREBRAL BLOOD FLOW AND BLOOD GASES IN MAN. *J. Appl. Physiol., 35(1):111-116, July 1973. 23 refs.*

Cerebral blood flow (CBF), arterial and jugular venous pH, P sub CO2, P sub O2, oxygen saturation percent (sat %), and lactate concentration were measured in five patients before and after moderate carbon monoxide exposure (mean carboxyhemoglobin concentration 20%) and in another five patients before and after hemodilution using a solution of human albumin. The xenon 133 intra-arterial injection method was used for the flow measurements. The Pa sub CO2 remained constant during the studies. The CBF increased both after carbon monoxide exposure and after hemodilution. The increase was more pronounced after carbon monoxide exposure. This was explained by the shift toward the left of the oxyhemoglobin dissociation curve (ODC) during carbon monoxide exposure. Jugular Pv sub O2 decreased slightly during carbon monoxide exposure but remained constant during hemodilution. Changes in blood viscosity might contribute to this finding. A highly efficient mechanism maintains the brain s oxygen supply during both conditions. (Author abstract)

31345 APTIC NO. 52764

Prival, Michael J. and Farley Fisher

FLUORIDES IN THE AIR. *Environment, 15(3):25-32, April 1973. 61 refs.*

Fluoride is released into the air in large quantities by aluminum reduction plants, phosphate processors, steel mills, coal burning operations, brick and tile manufacturers, and various less significant sources. It can cause adverse effects when ingested by domestic animals or absorbed by plants. Fluoride air pollution can adversely effect human health. Fluorides are released into air in both a gaseous state as hydrogen fluoride and silicon tetrafluoride and in solid particles. Nationwide control of airborne fluorides is needed. The simultaneous control of levels of fluoride in the air and levels in sensitive plants, in food, and in forage should all be included in any set of standards. Permissible concentrations should be determined by field studies in areas where fluoride pollution is a problem. Improvement in occupational health standards for hydrogen fluoride and other airborne fluorides is needed. Any devices used to control emissions of fluoride from polluting industries can, and should, be designed to minimize exposure of the people who work within industry. Monitoring of fluorides is mentioned.

31346 APTIC NO. 53049

Rusakov, N. V., G. I. Korotkova, and V. Sh. Bikbulatov

EXPERIMENTAL STUDY OF THE ALLERGENIC ACTION OF ORTHO- AND PARA-NITROCHLOROBENZENE. *(Eksperimental noye izucheniye allergennogo deystviya orto- i para-nitrokhlorbenzola). Text in Russian. Gigiena i Sanit., no. 3:13-16, 1973. 13 refs.*

The allergenic effect of ortho-, para-nitrochlorobenzene and 2,4-dinitrochlorobenzene on skin or by inhalatory application on albino rats and guinea pigs was studied. While all isomers produced a state of allergy in the test animals, ortho and para-nitrochlorobenzene had less powerful allergenic action than 2,4-dinitrochlorobenzene, and the action of para-nitrochlorobenzene was most pronounced. The prolonged inhalation of 0.008 mg/cu m concentrations of ortho and para-nitrochlorobenzene (minimum effective concentrations) caused allergic sensibilization. Passive transmission of allergy from albino rats, sensibilized with ortho and para-nitrochlorobenzene, and especially their mixtures, to intact guinea pigs by means of leucocytes and serum was observed.

31347 APTIC NO. 53227

Sadoul, P.

SIGNIFICANCE OF BRONCHIAL HYPEREXCITABILITY TESTS IN EPIDEMIOLOGICAL SURVEYS OVER BRONCHOPULMONARY AFFECTIONS. *(Interet des epreuves d hyper-excitabilite bronchique dans les enquetes epidemiologiques broncho-pulmonaires). Text in French. Bull. Physio-Pathol. Respir. (Nancy), 9(3):517-522, May-June 1973. 25 refs.*

The value of bronchial hyperexcitability tests in epidemiological surveys over chronic non-specific respiratory diseases in occupational and nonoccupational exposure is demonstrated. Prior to becoming constantly lowered, the peak expiratory flow rate is modifed by the action of histamine or acetylcholine aerosols, which later consequently lend themselves for use in hyperexcitability tests. Small amounts of acetylcholine, especially when absorbed in the form of aerosol, cause the peak expiratory flow rate to drop. In a hyperexcitability tests, the proportion of positive reactions to acetylcholine was 30% among subjects living in the polluted districts of the town, against 3% in subjects living in nonpolluted districts. Long-term exposition to bronchial irritants of occupational origin, such as isocyanate or enzymes, frequently entrains bronchial hyperexcitability.

31348 APTIC NO. 52718

Saito, Masaki

PAST AND PRESENT SITUATION OF PHOTOCHEMICAL SMOG IN JAPAN. *(Kokagaku sumoggu no keika to genjo). Text in Japanese. PPM (Japan), 4(7):32-40, July 1973. 17 refs.*

The photochemical smog situation in Japan is reviewed based on statistical data for 1970-1972. A total of 17,887 persons complainted of eye and throat irritation in 4 prefectures in 1970. In 1971, the number of complaints increased to 48,118 and the polluted areas spread to 7 prefectures. The number of complaints in 1972 decreased again to 21,245, but the areas of complaint covered 13 prefectures. Warnings about smogs have increased from 7 times in Tokyo in 1970 to 103 times in 7 prefectures in 1971 to 176 times in 14 prefectures in 1972. The photochemical smog situation was correlated with hydrocarbon emissions from cars, organic solvents, and the petroleum industry.

31349 APTIC NO. 53094

Salvaggio, John, Takeshi Kawai, and John Seabury

NEW ORLEANS EPIDEMIC ASTHMA: SEMIQUANTITATIVE AEROMETRIC SAMPLING EPIDEMIOLOGIC AND IMMUNOLOGIC STUDIES. *Chest (Suppl.), 63(4):14S-15S, April 1973. (Presented at Aspen Conference, 15th Annual.)*

Seasonal outbreaks of reversible obstructive pulmonary disease have occurred for years in the city of New Orleans. The episodes are primarily nocturnal and involve atopic individuals with broad patterns of type one skin reactive to a battery of common inhalant allergens. A 2-year study of the relationship between climatologic variables, hospital asthma emergency room admission rates, and semiquantitative particulate pollen and fungal spore counts was performed. The data suggest that, in New Orleans, epidemic asthma results from sensitization of the local atopic population by diverse natural particulate inhalants acting in seasonal patterns as commonly noted in such individuals. Ambrosia pollen, small deuteromycete and ascomycete spores, basidiospores, and possibly common antigens in plant remnants constitute likely offending particulates. Certain climatologic conditions appear necessary for precipitation of epidemics, especially large fall outbreaks, and these factors may be directly responsible for increased atmospheric particulate matter concentrations.

31350 APTIC NO. 52891

Sasamoto, Hiroshi and Tetsuro Yokoyama

CLINICAL, MEDICAL INVESTIGATION AND STUDY ON SERIOUSLY DAMAGED HEALTH DUE TO AIR POLLUTION. *(Taiki osen ni yoru jutoku kenko higai no rinsho igakuteki chosa kenkyu). Text in Japanese. Japan Environmental Agency, 35p., March 31, 1973.*

The research project for 1972 on physical damages by photochemical smog, on the role of mobile pollution victim clinics, and on the capacity of the equipment installed in the mobile clinic are reported; the future projects for clinical studies of smog health effects are discussed. The performance of electrospirometers, 3Hz respiratory impedance meters, and artery blood gas analyzers were evaluated, and indexes for normal healthy persons were obtained. The average measurements, standard error, 5% elimination limits were examined. The equipment was evaluated by applying them to diagnosing clinically tested bronchitis and bronchiole inflammation cases. Bronchitis was determined by the occurrence of coughing, sputum, and irregular respiratory sound, but without X-ray shadows suggesting lung emphysema or fibrosis. The inflammation of bronchiole or rather small airways was diagnosed by attacks of dry coughs, chest pain, chest pressure, sounds of small bubbles or scratches, and X-ray shadows of scattered spots, but no extraordinary shadows suggesting tuberculosis, pneumonia, bronchial distention, or fibrosis, and no irregularity of 1-second lung capacity by spirometry and normal 3Hz respiratory impedance. The superiority of electrospirometer to the previously used respirometer was proved. The respiratory resistance meter also showed a superior detection capacity as a screening test equipment, especially detecting bronchitis and bronchiolitis with artery oxygen partial pressure decrease.

31351 **APTIC NO. 52906**

Scrimshire, David A. and Peter J. Tomlin

GAS EXCHANGE DURING INITIAL STAGES OF N2O UPTAKE AND ELIMINATION IN A LUNG MODEL. *J. Appl. Physiol., 34(6):775-789, June 1973. 32 refs.*

A mathematical model is presented to define all constituent alveolar gas tensions during the initial stages of nitrous oxide induction and excretion. The proposed model contains structural elements that are directly comparable to actual sites in the lungs, and the derived equations are offered as an alternative to the classical continuous flow analysis which is limited to describing steady-state conditions. Changes in venous blood composition caused by the exchange of nitrogen and N2O at the body tissues during the unsteady state are accounted for, and the effect of differing blood circulation times is evaluated. Simulations are presented to illustrate the effect of differing levels of minute volume, cardiac output, and inspired N2O concentration upon alveolar and arterial oxygen and carbon dioxide tensions during the initial stages of N2O induction and excretion. The influence of lung size is also shown. The change in the total preinspiratory lung volume occasioned when inspired and expired volumes are kept constant during the periods of N2O uptake and excretion are discussed as an alternative to the general case in which FRC is held constant and expired volume varied. Comparison of the model prediction of expired gas tensions with values obtained from three normal subjects during N2O induction shows good agreement. (Author abstract)

31352 **APTIC NO. 53064**

Snider, Gordon L., J. A. Hayes, Agnes L. Korthy, and George P. Lewis

CENTRILOBULAR EMPHYSEMA EXPERIMENTALLY INDUCED BY CADMIUM CHLORIDE AEROSOL. *Am. Rev. Respirat. Disease, 108(1):40-48, July 1973. 27 refs. (Presented at the Aspen Conference on Research in Emphysema, June 6, 1972.)*

Rats were exposed to a polydisperse aerosol of cadmium chloride solution for 1 hr on 5, 10, or 15 occasions. The animals developed acute vascular congestion and alveolar hemorrhage followed by polymorphonuclear cell infiltration. A granulation tissue response which tended to be localized around respiratory bronchioles subsequently occurred. By the 10th day after exposure, the granulation tissue had undergone rapid transformation to fine scar tissue with dilatation, distortion, and destruction of adjacent alveoli. The appearance of the lesions resembled human centrilobular emphysema. The severity of the emphysema as measured by the mean linear intercept method was related to the number of exposures to cadmium aerosol. Measurement of tissue cadmium confirmed accumulation of cadmium in the lungs of exposed animals; the concentration of cadmium was proportional to the number of exposures. It was previously shown in autopsy studies that there is an increased cadmium content in the kidneys and livers of patients with chronic obstructive lung disease and that the body burden of cadmium is positively associated with the number of pack-years of cigarettes smoked. Cigarette smoke is known to contain cadmium. This there is a possible link between cadmium inhalation from cigarette smoking and the development of centrilobular emphysema. (Author abstract)

31353 **APTIC NO. 53485**

Stankiewicz, Zofia, Jadwiga Jastrzebska, and Barbara Majewska

THE NUTRITIVE VALUE OF THE RYE GROWN IN A REGION OF INDUSTRIAL POLLUTION WITH NITROGEN COMPOUNDS. *(Wartosc odzywcza zyta uprawianego w rejonie przemyslowych zanieczyszczen zwiazkami azotu). Text in Polish. Roczniki Panstwowego Zakladu Higi, 24(2):215-220, 1973. 13 refs.*

The effects of atmospheric pollution with nitrogen compounds of industrial origin on the contents of protein, nitrates, and ash, and on the nutritional value of the protein in rye grown in the polluted atmosphere were investigated. The qualitative and quantitative evaluations of the nutritive quality of protein in rye were conducted by biological methods. The diet s growth efficiency was measured by protein consumption and total dietary components per unit of body weight increase. The animals used during experiments were 1-day-old Wistar rats weighing 45 to 55 g. Three types of diet were used: the experimental diet, the control diet, and the non-albuminous diet. Despite the fact that the nitrogen and raw protein in the corn of rye from the area of the artificial fertilizers plant was twice higher than the content in the controls, no accumulation of nitrates was observed in the corn. Biological investigations indicated that the increase in protein content in the rye grown in the areas polluted with nitrogen compounds was accompanied by a considerable decrease in its biological quality. The value of the NPU index was lower by nearly 11% in the rye from the area of the chemical plant than in the controls. The polluted rye diet consumed was 4.3 g/rat/24 hr. Controls consumed 5.6 g/rat/24 hr. The protein contents were 13.3 for plant rye and 12.6 g/rat/24 hr, for control rye, respectively. The apparent increase of body weight was 0.51 for plant rye, and 1.14 g/rat/24 hr for control rye, while the real body weight increase was 1.04 in rats fed plant rye, and 2.03 in rats fed control rye. Rats fed plant rye consumed 3.34 g and white rats fed control rye consumed 2.79 g/g of actual body weight increase. In the first case, the protein consumed was 0.44, in the latter case, it was 0.35. These figures prove, that for similar concentrations of protein, the body weight increase in rats fed polluted rye was actually lower, therefore the diet less efficient. The difference of 11% becomes statistically significant, proving that chemical industry does pollute the air, and endangers the quality of agricultural products humans feed upon.

31354 **APTIC NO. 53039**

Stynes, Dennis V. and Brian R. James

REACTION BETWEEN IRON PORPHYRINS AND CARBON MONOXIDE. A KINETIC MODEL FOR MYOGLOBIN. *Chem. Commun., no. 10:325-326, May 23, 1973. 11 refs.*

Kinetic studies of the reaction between carbon monoxide and (piperidine)2iron(porphyrin) complexes to give (piperidine)Fe(CO) (porphyrin) show that the mechanism involves predissociation to a five coordinate (piperidine)Fe(porphyrin) complex; the data for the protoporphyrin IX system suggest that the model may resemble closely in kinetic properties, the active iron site in deoxymyoglobin and deoxy-hemoglobin.

31355 **APTIC NO. 52786**

Sugibayashi, Teruo

INFLUENCE OF AIR POLLUTION ON THE RESPIRATORY SYSTEM OF HOUSE DOGS -- A HISTOPATHOLOGICAL STUDY. *(Taiki osen no kokyukikei ni oyobosu eikyo ni kansuru byori soshikigakuteki kenkyu). Text in Japanese. Chiba Igakkai Zasshi (J. Chiba Med. Soc.), 49(3):197- 205, 1973.*

The effects of air pollution on the respiratory system were studied on 45 dogs in a polluted area of Fuji city and nine dogs from a nonpolluted area. Histopathological examinations showed that 21 cases out of 45 in polluted areas had increased proliferation of goblet cells in the trachea and bronchi, and especially covering a large area of bronchiole. In advanced cases, the proliferation of basal cells was notable. This was particularly prevalent among dogs more than 4 years old. There was no case of lung cancer. The mucous membrane of trachea and bronchi showed symptoms of chronic bronchitis, and inflammatory cell encroachment and fibrosis were noted among older dogs; 12 out of 17 had the former and 16 out of 17 had the latter. Light to medium cases of emphysema were recognized in 35 out of 45, and three had advanced emphysema around the lobes.

31356 **APTIC NO. 53255**

Tahara, E.

INFLUENCE OF AIR POLLUTION ON LIVING BODIES, C, REVIEWED FROM PATHOLOGY. *(Taiki osen no seitai ni oyobosu eikyo, C. Byori no tachiba yori). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), 26(7):858-861, 1973. 12 refs.*

The deposition of black dust in humans and dogs in polluted areas is increased with age and is correlated with the amount of falling dust. Mice and rats have been exposed to sulfur dioxide concentrations of 200 and 100 and 50 ppm, respectively; cilia fell out and mucus secretion was accentuated due to proliferation of the myxocytes and appearance of squamous epithelium in the airways as the inhalation duration increased. Sulfur dioxide is absorbed in the upper airway, then absorbed by the blood, and exhausted the peripheral bronchioles or alveoli. Sulfur dioxide exposure may cause pulmonary emphysema. The occurrence of lung cancer has been epidemiologically correlated to the amount of dust fall, floating dust, and sulfur dioxide.

31357 **APTIC NO. 53470**

Takizawa, Y., I. Hagima, and T. Onashi

EPIDEMIOLOGICAL STUDY OF THE EFFECT OF AIR POLLUTION ON HUMAN BODIES IN NIIGATA-CITY (THIRD REPORT). *(Niigata-shi ni okeru taiki osen no jintai ni oyobosu eikyo no ekigakuteki kenkyu, dai 3 po). Text in Japanese. Niigata-Ken Ishikai-Ho (J. Niigata Med. Assoc.), no. 3:1-4, 1973. 4 refs.*

Eight patients, who showed symptoms of chronic bronchitis and impaired lung functions and were considered to be possible victims of air pollution, were subjected to x-ray, urine, blood, and lung function examinations. Five patients had light pulmonary fibrosis which is common in the elderly and could not be conclusively attributed to air pollution in Niigata. All patients showed normal urobilinogen and protein values in urine and calcium, sodium, potassium, protein, albumin, and globulin in blood were also normal. Four patients had either low or high acidocyte values, and two patients had high blood pressure. The general results were not conclusive as to whether the symptoms resulted from air pollution.

31358 **APTIC NO. 52833**

Tanaka, Masashi and Hidenori Dodo

THE EFFECTS OF AIR POLLUTION ON RESPIRATORY ORGANS IN OTAKE, KURE, AND FUKUYAMA CITIES (FISCAL 1971). *(Otake, Kure oyobi Fukuyama-shi ni okeru taiki osen no kokyuki ni oyobosu eikyo, Showa 46-nendo). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), 26(2):151-164, 1973. 4 refs.*

The 1971 investigations of the effects of air pollution on the respiratory system in Otake, Kure, and Fukuyama cities were conducted between Oct. and Nov., and partially in Dec., by a questionnaire. Randomly selected people from various areas responded at the rate of 94.5% male, and 96% female. Most of the examinees had lived in the area for at least 5 years, and 84.6% for more than 10 years. Male smokers were 74.7% and female nonsmokers were 87.2%. The results of the questionnaires are presented in tables. High morbidity was noted in the categories of cough, sputum, short breath, rhinitis, respiratory diseases causing bedrest, and past record of bronchitis. Compound symptom rates were generally low, except for cough and sputum. Only a few districts showed significantly high morbidity, and generally, it was confirmed that the effects of pollution were still limited in these cities. However, in a few districts, chronic bronchitis morbidity has risen since the preceding year. The sulfur dioxide level in the atmosphere and the quantity of settling particles have been increasing in Fukuyama city for the past several years, and in one district, the lung functions of both males and females were significantly lower than those of other districts. There was a definite and significant sign of higher morbidity among smokers.

31359 **APTIC NO. 53098**

Teculescu, Dan and Anatol Albu

PULMONARY FUNCTION IN WORKERS INHALING IRON OXIDE DUST *Int. Arch. Arbeitsmed., 31(2):163-170, 1973. 29 refs.*

The lung function of a group of 14 adult male workers exposed to iron oxide dust was studied. Among the workers, who varied in age from 30 to 60 years and who had been exposed to the dust for 4 to 13 years, the vital capacity was essentially normal. The blood oxygen tension was normal in seven subjects, with five having borderline figures and another having slight hypoxemia. The transfer factor was normal in all but one subject, in whom the figure was slightly decreased. The transfer coefficient was also normal in all but one of the workers, as was the total lung capacity. The residual volume was high in one subject and borderline in three others. That fibrosis of the lung was uncommon following inhalation of pure iron oxide. Lung function results are given for static lung volume, forced expiratory volume, transfer factor, and blood oxygen tension.

31360 **APTIC NO. 53168**

Tennant, Forest S., Jr.

HAS AIR POLLUTION AFFECTED OUR HEALTH? TIT J. Life Sci., 3(2):67-69, 1973. 23 refs.

Although there is no concrete evidence that air pollution causes a specific disease, epidemiological studies indicate that it has an adverse effect on health. The most common health effects of air pollution are irritation to the eyes, nose, and throat. During episodes of high air pollutant concentrations, infants, the elderly, and persons with cardiovascular and respiratory diseases experience high mortality and morbidity rates. Chronic exposure to air pollution increases the incidence of respiratory diseases, lung cancer, and cardiovascular diseases. To combat the mortality and morbidity rates associated with pollution, many major metropolitan areas have developed organized air pollution plans based on a combination of weather forecasting and measured levels of sulfur dioxide, oxides of nitrogen, carbon monoxide, and particulate matter in the ambient air. In several areas, these plans have formalized into alert systems which warn the public and physicians and allow particularly susceptible individuals to protect themselves with medication, air filters, or individuals to protect themselves with medication, air filters, or evacuation from their residences. The 1970 amendments of the Clean Air Act of 1963 have been aimed at reducing pollution from automobiles. In the future, gasoline and/or travel may have to be restricted to further reduce pollution from this source.

31361 **APTIC NO. 53251**

Terayama Hiroshi

ENVIRONMENTS AND CARCINOGENS-THE MECHANISM OF CARCINOGENESIS. *(Kankyo to gangenseibushitsu. Kagaku hatsugan no kiko). Text in Japanese. Rodo no Kagaku (Dig. Sci. Labor), 28(6):30-35, June 1973.*

Carcinogens include polycyclic aromatic hydrocarbons, aromatic amines, amino azo dyes, aromatic nitro or nitroso compounds, N-alkyl nitroso amines, and alkylating agents. The carcinogens can modify or be bound to tissues. Most of them must be metabolically activated to yield cationic radicals which are bound to the biomolecules. Factors determining or affecting the carcinogenicity of a chemical are discussed and can be understood by considering the balance between activating and non-activating metabolisms.

31362 **APTIC NO. 52734**

Tomita, Kinuko, Toshio Kawaraya, and Kosuke Haruki

STUDIES ON CO EXPOSURE AMONG NEIGHBOURS OF URBAN TRAFFIC (REPORT 3). EFFECT OF AUTOMOTIVE EXHAUST UPON THE WORKERS. *(Kokichu CO nodo kara mita CO mansei bakuro no jittai ni kansuru kenkyu (daisanpo). Jidosha hai gasu osen shokuba kinmuin no kokichu CO nodo). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 19(8):412-417, 1973. 25 refs.*

Carbon monoxide concentrations in expired air of different groups of workers decreased in the following order: underground parking workers, highway toll collectors, underground road workers, loading and unloading workers, and traffic policemen. Mean CO values in expired air of each group were compared with those of schoolchildren within normal range (2.5 ppm). The values were four times higher in traffic policemen, five times higher in unloading workers, six times higher in underground road workers, seven times higher in unloading workers, nine times higher in elevator operators at underground tunnels and highway toll collectors, and twelve times higher in underground parking workers. (Author abstract modified)

31363 **APTIC NO. 52831**

Villar, T. G., Ramiro Avila, and A. Telles de Araujo

PULMONARY GRANULOMATOSES DUE TO INHALED PARTICLES: PERSONAL EXPERIENCE AND SOME IMMUNOLOGICAL CONSIDERATIONS. *Clin. Allergy, 3(2):217-223, June 1973. 24 refs.*

Clinical, radiological, functional, laboratory, and pathologic studies on 114 patients with bronchopulmonary granulomatoses due to inhaled particles are presented, together with measurements of the levels of IgA, IgG, and IgM found in the sera of 73 of the patients compared with those of 40 blood donors uses as normal controls. No differences were found between organic or inorganic dusts as causes in any of these parameters. A significant increase in IgA and IgG occurred as compared with the controls. The possibility of a common pathogenic factor for this disease, independent of the nature of the causal agent, is discussed. (Author abstract)

31364 **APTIC NO. 53062**

Viswanathan, P. N., Mohini Anand, Qamar Rahman, M. U. Beg, and S. H. Zaidi

BIOCHEMICAL CHANGES IN SERUM OF GUINEA PIGS IN EXPERIMENTAL ASBESTOSIS. *Chemosphere, 2(3):119-124, May 1973. 14 refs.*

Eighty guinea pigs were inoculated intratracheally with 50 mg amosite asbestos suspended in 1.5 ml of normal saline, and 70 animals received only 1.5 ml saline as control. Six animals from each group were sacrificed and studied at 0, 1, 2, 7, 15, 30, 60, 90, 120, 150, and 300 days after injection. The constituents of potential diagnostic value in the serum including serum proteins, serum albumin, serum globulin, and enzymes were measured. The control animals had no change in levels of various fractions of the serum. In the first fortnight after injection, the total protein, albumin, and globulin content initially decreased and then approached normal values. After 15 days, total protein fluctuated in the normal range, albumin decreased consistently, and total globulin increased. At 120 days the albumin/globulin ratio was reduced to half of normal. At 300 days the change in both albumin and globulin was of a smaller magnitude than at 150 days. The values for gamma-globulin increased gradually up to 150 days. At 300 days the content was similar to that at 150 days. Amosite caused an increase in glutamic oxaloacetic transaminase, glutamic pyruvic transminase, acid phosphatase, and lactic dehydrogenase activities (48, 40, 33, and 138%, respectively) and a decrease (19%) in alkaline phosphatase activity. The results support and confirm observations on asbestos workers with respect to alterations of serum albumin and globulin fractions.

31365 **APTIC NO. 52898**

Waldbott, George L.

AIR POLLUTANTS: A CLASSIFICATION ACCORDING TO THEIR HEALTH EFFECTS. *J. Asthma Res., 10(3):181-187, March 1973. 14 refs.*

In an effort to aid the physician who desires to investigate the health effects of a particular air pollutant, a scheme for classifying pollutants with respect to their effect on human health is presented. Two distinct features dominate a pollutant s action on the human organism: most, if not all, pollutants attack in their own specific manner (pollutant-specific agents), but often the specific host responses are the same regardless of the pollutant (host-specific agents). The pollutant-specific group divides into two categories with respect to the site of their major impact--respiratory pollutants and systemic pollutants. Allergenic agents, carcinogens, mutagens, and teratogens further divide the host-specific pollutants; pulmonary irritants, asphyxiants, fibrosis-producing sgents, granuloma- producing agents, and fever-producing agents are the subcategories of the respiratory pollutants. Although some overlapping between the groups is unavoidable, a separation can be maintained if the principal characteristics of the specific pollutant are considered.

31366 **APTIC NO. 53081**

Wolf, Muriel D.

LEAD POISONING FROM RESTORATION OF OLD HOMES. *J. Am. Med. Assoc., 225(2):175-176, July 9, 1973. 5 refs.*

Lead poisoning was diagnosed in four children from two families involved in the restoration of old homes. Blood lead levels in the children were in the 58 to 90 micrograms/100 ml range; the upper normal limit in children is considered to be 35 micrograms/100 ml. The elevated blood levels were probably due to inhaling or swallowing small lead particles floating in dust clouds generated by the sanding and scrapping of old paint. Analysis showed that paint chips contained up to 35% lead. Workers in one house also developed elevated blood levels.

31367 **APTIC NO. 52823**

Yamaga, Shinro, Kaoru Ohmori, Isao Murakami, Katsunori Ohmura, Masamichi Ichihara, and Osamu Takahashi

EXPERIMENTAL STUDIES ON THE HEALTH EFFECTS OF AUTO EXHAUST GAS IN LOW CONCENTRATIONS. REPORT 3. HEART RATE OF RABBITS UNDER EXPOSURE TO EXHAUST GAS. *(Teinodo jidosha haiki gasu no eikyo ni kansuru jikkenteki kenkyu, daisanpo: Haiki gasu bakuroji ieusagi shinpakusu ni tsuite).*

Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 19(2): 61-65, 1973. 27 refs.

Pulse rates and the function of the autonomic nervous system were observed in rabbits exposed to exhaust gas for 260-500 days. Pulse rates increased considerably in two of three rabbits continuously exposed to lower exhaust gas concentrations (20-30 ppm as carbon monoxide), while those of previously unexposed control animals scarcely changed in response to the same concentrations. Although pulse rate in response to higher concentrations (1000-1500 ppm as CO) increased in both groups, peak pulse rate was reached after 15-18 min in the experimental group and 5-8 min the control group. The experimental group showed stronger reactions to acetylcholine than the control group. (Author abstract modified)

31368 **APTIC NO. 53250**

Yamagiwa, Hiroshi, Susumu Takeda and Yasuo Sakakura

PATHOLOGICAL DISORDERS OF RESPIRATORY TRACT AT AIR-POLLUTED AREA IN YOKKAICHI - COLLECTION OF PATHOLOGICAL FINDINGS UNTIL NOW. *(Yokkaichi taiki osen to kokyuki byohen - genzai madeno byorigakuteki chiken no matome). Text in Japanese. Mie Igaku (J. Med., Mie Prefect. Univ.), 16(4):457-462, March 1973. 7 refs.*

Autopsied humans from Yokkaichi had a high frequency of chronic bronchitis with emphysema accompanied by bronchial asthma. The deposition of dust was higher with age, especially in men, due to smoking. Generally there was little proliferation of fiber. The effect of air pollution in Yokkaichi had a deeper relation to gaseous pollutants such as sulfur dioxide and its oxidized compounds. The relationship between pollution and lung cancer was not clear. Rabbits exposed to the highly polluted Yokkaichi air for 22 months showed apneumatic lung, bronchiolitis, bronchiopneumonia, hemorrhage, thickening and atrophy of the bronchial epithelium, and disappearance of the cilia and showed no charcoal dust deposition. Domestic fowl bread for 15,19, and 14 months in polluted and unpolluted areas showed disappearance of cilia, proliferation of mucous cells, infiltration of the lymphocyte, and alteration of the mucous membrane on the nasal cavity. Experimental mice were exposed to 0.03 ppm for 15 weeks. They had bronchopneumonia, bronchiolitis, septal pneumonia, broncho-pneumonia, and changes in the epithelium and mucus.

31369 **APTIC NO. 52788**

Yamamoto, Takehiko

THE HEALTH OF CHILDREN IN A POLLUTED ENVIRONMENT (AIR POLLUTION). *(Kogai kankyo ka no kodomo no kenko, toku ni taiki osenka no baai o chushin ni). Text in Japanese. Taiiku no Kagaku (J. Health, Phys. Educ., Res.), 23(6):376-380, 1973. 4 refs.*

The environmental awareness of schoolchildren in an industrial area with an average sulfur dioxide concentration of 0.02 ppm/day and in a nonpolluted mountain region was investigated by a questionnaire. In the polluted area, 1.5% felt the environment was very much polluted, 33.5% felt it was polluted, and 56.4% felt it was not polluted. In the unpolluted area, 14.3% felt it was polluted and 85.7% did not feel it was polluted. Thus, an awareness investigation often depends on the subjective view of the person who is accustomed to the environment and is not necessarily scientific. The effects of aerosols and suspended particles which are major pollutants in the air should be studied in the form of antigen/antibody reaction and the reaction of the body airway mucous membranes. These pollutants stimulate allergic bodies and induce attacks of asthma. Allergic reaction is often induced when the children are moved into a new environment, and psychological tension often contributes to it. Asthmatic attacks occur during night or early morning and seldom occur during school hours. In polluted areas the absenteeism of children and their complaints about coughing coincide. Absenteeism of a nonpolluted school and a polluted school were compared. The peak for the number of absent children appears to be slightly lagging behind the rise of pollutant concentration. But the absence rates are both 2.2%. The main causes for the children s absence in the polluted school were congectivitis, tons[illegible], and rach; pneumonia, trachoma, asthma, and the digestive system diseases followed.

31370 **APTIC NO. 52752**

Yeung, C. K. K. and C. R. Phillips

ESTIMATION OF PHYSIOLOGICAL SMOG SYMPTOM POTENTIAL FROM CHEMICAL REACTIVITY OF HYDROCARBONS. *Atmos. Environ., 7(5):551-559, May 1973. 20 refs.*

Eye irritation, a photochemical smog symptom, depends both on the rate of chemical reaction of hydrocarbons in air in the presence of nitrogen oxides, and the irritation potential of the lachrymators formed. Using data reported by Heuss and Glasson (1968), it has been verified that eye irritation can be successfully correlated with chemical measurement by the equation: relative eye irritation reactivity equals relative chemical reactivity times biological effect factor. The correlation is highly significant with sample correlation coefficient greater than +0.99. The biological effect factors have distinct physical significance and parameters derived from one set of hydrocarbons can be used successfully to predict the eye irritation reactivity of other hydrocarbons. It is expected that other physiological symptoms can be similarly correlated with chemical reactivity. Therefore, relative chemical reactivity should be chosen as the basic reactivity scale for hydrocarbons with which all smog symptoms can be related by the corresponding biological effect factors. (Author abstract)

31371 **APTIC NO. 52787**

Yokohashi, Goro

AIR POLLUTION. *(Taiko osen). Text in Japanese. Taiiku no Kagaku (J. Health, Phys. Educ., Res.), 23(6):354-356, 1973.*

Air pollutants, the weather, and the recipients of the effects are discussed. In order to grasp clearly the effects of air pollution on human health, a pollutant concentration index must be clearly measured, at least one clear effect of it on human health must be evaluated, and the relationship between the two must be established. If there is a clear, meaningful, and quantitative relationship established, if a logical cause and effect can be hypothesized, and if a reasonable number of examples are found, that air pollutant can be attributed as the cause of the health effect. The effects must be measured on groups with susceptibility to such pollutants from the standpoint of sex, age, and health conditions. Schoolchildren are free of occupational hazards and smoking and are susceptible to the environment, and therefore can be considered as a criterion group.

31372 **APTIC NO. 52781**

Yoshida, Katsumi

ENVIRONMENTAL POLLUTION AND CHILDREN S HEALTH. *(Kankyo osen to shoni hoken). Text in Japanese. Shoni Hoken Kenkyu (J. Child Health), 31(6):249-256, 1973.*

Main air pollutants and their physical effects are discussed. Children inhale an average of 5-10 cu m of air per day, or 6-12 kg, which is much greater in volume than the 2-3 kg of food and beverages they take in daily. The air inhaled per year is 2-4 tons per person, and the amount of pollutants inhaled can still cause much harm. Sulfur dioxide is never inhaled as pure SO2, but is usually adsorbed on particles and aerosols, which easily invade the lower air passages and bronchial walls of lungs deeply. Sulfuric acid mist is particularly harmful because of its toxicity as acid and its easy deposition in the lungs. Nitrogen oxides are harmful because: they invade the lower airways and cause inflammations like SO2; they can react photochemically and create harmful photochemical oxidants; and there is a suspicion of NOx turning into carcinogens. Oxidants cause congestion of air passages, eye irritation, and in many cases numbness of the limbs, nausea, increase of leukocytes and of alkaline phosphatase, and unconsciousness. To counter the hazards of these toxic pollutants and to protect the health of children, physical fitness programs, offering summer camps and classes in the country environment, group training in clean-air suburbs, periodical physical examinations, allergy tests, and the use of air purifiers in the classroom are necessary.

31373 APTIC NO. 53035

Zaborowski, Leon M.

DETERMINATION OF MERCURY LEVELS IN WISCONSIN RESIDENTS: A PROJECT INVOLVING SECONDARY SCHOOL STUDENTS. *Wis. Acad. Sci., Artist Lett. Trans., vol. 61:235-258, 1973. 12 refs.*

A project involving secondary school students to determine mercury levels in Wisconsin residents is described. Hair samples were obtained from 200 students throughout the state. After decomposition of the hair, mercury content was found by flameless atomic absorption. Hair shampoos were also tested as possible sources of mercury. Results of the tests are discussed. The vast majority of hair samples fell within the normal range of mercury content, with the mode falling between 0.0 and 2.0 ppm. Hair samples high in mercury came from people living close to state waters reported to contain fish with a high element of mercury. Testing of 15 different brands of shampoos showed that 13 contained essentially no mercury, while two brands had 1.5 and 3.1 ppm mercury, levels low enough to be considered insignificant. (Author abstract modified)

1972

31374 APTIC NO. 53381

Thomas Jefferson Univ., Dept. of Physiology, Philadelphia, Pa.,

THE EFFECTS OF CHRONIC EXPOSURE TO CARBON MONOXIDE (100 PPM) ON THE CARDIOVASCULAR SYSTEM OF MONKEYS. *Coordinating Research Council, Inc., Contract CRC-APRAC, Proj. CAPM -4-68, 52p., July 1972. 3 refs.*

NTIS: PB 215527

Experimental infarctions were induced in monkeys by selectively depositing polystyrene microspheres (300 micron) in the left coronary artery in order to obtain quantitative correlations between chronic exposure to 100 ppm carbon monoxide and physiologic parameters of the cardiovascular system and blood of normal and infarcted monkeys. Both groups of animals were exposed continuously (23 hrs/day) for 3 and 6 mo. Air-breathing control and the infarcted animals were housed in separated quarters removed from the chamber area. Significant and persistent characteristic elevations in microhematocrit, hemoglobin, and red cell count were observed after 3 wk of exposure in both groups exposed to the CO. Electrocardiograms of the infarcted and non-infarcted animals breathing carbon monoxide displayed increased P-wave amplitudes. The incidence of T-wave inversion was higher in infarcted than non-infarcted animals, suggesting a greater degree of myocardial ischemia in infarcted animals breathing CO. (Author summary modified)

31375 APTIC NO. 53541

Interdepartmental Task Force on Polychlorinated Biphenyls, Washington, D. C.

POLYCHLORINATED BIPHENYLS AND THE ENVIRONMENT. (FINAL REPORT). *Rept. ITF-PCB-72-1, 192p., March 20, 1972. 291 refs.*

NTIS: COM-72-10419

A six month review of polychlorinated biphenyls (PCBs) is presented. Its goal was the coordination of the scientific efforts of the Government aimed at understanding PCBs and the strengthening of the Government s ability to protect the public from actual or potential hazards associated with the PCBs. The task force made nine findings, conclusions, and recommendations, primarily pointing out that PCBs should be restricted to essential or nonreplaceable uses which would minimize the likelihood of human exposure or leakage to the environment. Supplementing the report are eight appendices detailing current knowledge about various aspects of PCBs, including their use and replaceability; occurrence, transfer, and cycling in the environment; occurrence and sources in food; and PCBs effect on man and animals.

31376 APTIC NO. 52909

Ariizumi, Michiyuki

INFLUENCE OF SULFUR DIOXIDE ON THE RESPIRATORY TRACT: ITS HISTOPATHOLOGICAL STUDY. *(Aryusargasu no kokyukini oyobosu eikyo ni tsuite tokuni sonobyori soshikigaku taki Kenkyu). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiko (J. Japan Broncho-Esophagological Soc.), 23(6):303-321, 1972. 13 refs.*

After 72 guinea pigs were exposed to sulfur dioxide for four different concentrations (7, 49, 125, 1070 ppm), and were exposed to the mixture of SO2 and coal dust for various lengths of time, the pharynx, larynx, trachea, and lung were histopathologically studied. The pharyngeal mucosa showed no extensive pathologic change even after the animals were exposed to high concentration SO2 in a short period of time, but there was thickening of mucosa and cellular infiltration within the submucous layer after they were exposed to low concentration SO2 for a long period of time. In the larynx, cellular infiltration in the submucous tissue, edema, and other pathologic change occurred in a relatively early stage of the experiment, and these changes tended to be prominent in the posterior surface of the epiglottis, glottis, and subglottic space. In the trachea, detachment and disappearance of ciliated epithelium, cellular infiltration in the submucous tissue, necrosis of epithelium, and cellular infiltration within and out of the tracheal cartilage were the noticeable changes. In the lung, the effect of SO2 was most prominently found, and pulmonary congestion, thickening and cellular infiltration of the interalveolar tissue, and localized pulmonary edema and emphysema were recognizable; these changes were more remarkable in the animals exposed to the mixture of SO2 and coal dust.

31377 APTIC NO. 52979

Asahina, S., J. Andrea, A. Carmel, E. Arnold, Y. Bishop, S. Joshi, D. Coffin, and S. S. Epstein

CARCINOGENICITY OF ORGANIC FRACTIONS OF PARTICULATE POLLUTANTS COLLECTED IN NEW YORK CITY AND ADMINISTERED SUBCUTANEOUSLY TO INFANT MICE. *Cancer Res., vol. 32:2263-2268, Oct. 1972. 29 refs.*

Groups of randomly bred infant Swiss mice were given subcutaneous injections of suspensions of an organic extract of particulate atmospheric pollutants collected in New York City; derived acidic, basic, neutral, aliphatic, aromatic, and insoluble fractions; and three oxyneutral sub-fractions, in total doses of 10, 20, and 40 mg. Each test group consisted of a minimum of 44 mice; concurrent controls were comprised of 81 untreated and 86 solvent-treated mice. There were wide variations in the overall carcinogenicity and incidence of tumors in various organs in different test groups. High incidences of hepatomas were found in males given injections of the basic fraction and to a lesser extent in males and females given injections of the organic extract. The incidence of lymphomas was high, particularly in females given injections of basic, aliphatic, and aromatic fractions and oxyneutral subfractions. Additionally, high incidences of solitary and multiple pulmonary adenomas were found in mice given injections of basic, neutral, and aromatic fractions and oxyneutral subfractions.

Coexistent multiple tumors were also found in mice given injections of basic and aromatic fractions and oxyneutral subfractions. Injection site tumors were rare. (Author summary)

31378 **APTIC NO. 52653**

Attwood, Dennis Albert

THE USE OF A SECONDARY TASK PARADIGM TO DETERMINE THE EFFECT OF ELEVATED LEVELS OF CARBOXYHEMOGLOBIN ON HUMAN PSYCHOMOTOR PERFORMANCE. *Ohio State Univ., Columbus, Dept. of Industrial Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 385p. 153 refs.*

The effects of low levels of carbon monoxide intoxication on humans performing complex psychomotor tasks were investigated. A series of three experiments was conducted; the experiments were sequentially administered so that experimental designs could be continually improved. The laboratory research was part of a larger study of the effects of low levels of CO intoxication on humans performing highway driving tasks. Highway driving experiments were conducted concurrently with the laboratory experiments and employed the same set of subjects. Carboxyhemoglobin levels below 20% were chosen for study in this project. A literature review is presented on carbon monoxide, time-sharing, and on human tracking research. The main hypothesis investigated was that time-sharing performance on a visual choice reaction time (CRT) task and a visual pursuit tracking task (PT) would deteriorate under the effects of mild CO intoxication. An attempt was made to develop a methodology for investigating the types of subtle behavioral effects that are similar to those produced by CO intoxication and to test this methodology in a practical situation. All the research projects are described in detail including: effects of CO intoxication on dual task performance; effects of CO on after-driving laboratory performance, eye movements and human information processing; and the relative effects of alcohol and CO intoxication on dual task performance. Results of the road and laboratory research test phases are compared, and a summary of all test results with a general discussion of the results is included.

31379 **APTIC NO. 52973**

Batulin, Yu. M., A. L. Klyashchitskaya, and K. N. Kulagina

TOXICOLOGY OF AN FM-1322 ORGANOSILICON HEAT-TRANSFER AGENT. *(K toksikologii kremniyorganicheskogo teplonositelya). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, 16(3):56-58, 1972. 6 refs.*

The liquid polymethylphenylsiloxane FM-1322, which is used as a high heat transfer agent and a lubricant, had no irritating, sensitizing, or toxic effects when applied in one to three drop quantities to the skins of rats and mice or to the eyes of rabbits. When heated to 90 to 100 C, carbon monoxide, carbon dioxide, formaldehyde, and benzene evolved from the liquid. The carbon monoxide (at 20 mg/cu m, formaldehyde (at 5 mg/cu m), and benzene (at 1.2 to 1.5 mg/cu m) had no toxic effects when inhaled by test animals over a period of 2 mo.

31380 **APTIC NO. 53404**

Benthe, H. F., J. Knop, and A. Schmoldt

ADSORPTION AND DISTRIBUTION OF POLYCHLORINATED BIPHENYLS (PCB) AFTER INHALATORY APPLICATION. *(Aufnahme und Verteilung nach Inhalation polychlorierter Biphenyle (PCB)). Text in German. Arch. Toxikol., vol. 29:85-95, 1972. 18 refs.*

The absorption and distribution of a mixture of low chlorinated biphenyls (PCB) (Pydraul A 200, Monsanto) was studied in male rats following a single exposure to an aerosol of the mixture. Very good absorption resulted from this method of inhalatory application. Depending on the duration of PCB exposure, a rapid increase in the PCB concentration of the liver was observed; the concentration after 15 min was more than 50% of the maximum concentration attained after nearly 2 hr (70 micrograms/g of tissue). The concentration in the fat after 30 min of exposure was 14 micrograms/g of tissue (about 27% the concentration in the liver), whereas the brain tissue concentration was only 9 micrograms/g of tissue (about 17% the concentration in the liver). During the 24 hours following the aerosol exposure, a rapid increase in the PCB concentration of the liver was observed, accompanied increased concentrations in the liver and brain; these increases were dependent on the time elapsed since the aerosol exposure. Within 2 days, the brain and liver PCB concentrations fell to a minimum value, while the fat levels rose to a maximum (260 micrograms/g of tissue) and remained constant thereafter. There was no toxic fatty degeneration of the liver under these conditions. The accumulation of PCB in the liver is discussed, along with its distribution from the organs to the fat.

31381 **APTIC NO. 53130**

Berardi, Siro

THE KILLING EFFECTS OF THE CITIES. *(Le citta stanno uccidendoci). Text in Italian. Lo Smog (Italy), 1972:26-28, 1972.*

Architects, urbanists, and physicians are among those who view cities as subtle enemies of man; the big disease of the century is madness and physicians and psychologiest put the blame for it on noise. Another acute danger is pollution; well known disasters occurred in 1957 in France, in 1952 in London, in 1948 in Donora in Pennsylvania, and in 1930 when 63 people died of smog in the Meuse valley in France. Milan had also its episodes. Urban areas can contain innumerable suspended particles of carbon with a diameter of approximately 0.075 micron which penetrate into human habitations and are inhaled. Worse are sulfur compounds, gaseous sulfur oxides and sulfuric acid resulting from interaction with atmospheric humidity. The noxious effect of sulfur compounds is compounded by the highly toxic carbon monoxide. The biggest ally of pollutants is fog which counteracts dispersion and causes concentration. In Italy fog is an irregular occurrence, Milan has 80 foggy days/year, Bologna 57, Turin 50, Ferrara 43, Parma 35, Venezia 23, and Rome and Naples 5. In the islands, years pass without a single foggy day. Smog is also damaging to property, it is estimated that in Pittsburgh such damage amounts to $10 million a year.

31382 **APTIC NO. 52585**

Camner, Per, Klas Philipson, and Lars Friberg

TRACHEOBRONCHIAL CLEARANCE IN TWINS. *Arch. Environ. Health, 24(2):82-87, Feb. 1972. 9 refs.*

Tracheobronchial clearance was studied with a test aerosol of 6-7 micron monodisperse fluorinated ethylene propylene particles tagged with a radioactive substance. The radioactivity of the lungs was tested in nine pairs of monozygotic and nine pairs of dizygotic twins. The clearance patterns in the monozygotic pairs were highly similar, and those in the dizygotic pairs tended toward similarity. Among the pairs, however, there was a remarkable difference in patterns. (Author abstract modified)

31383 **APTIC NO. 53416**

Clarkson, T. W., L. Magos, and M. R. Greenwood

THE TRANSPORT OF ELEMENTAL MERCURY INTO FETAL TISSUES. *Biol. Neonate, 21(3-4):239-244, 1972. 9 refs.*

The distribution of mercury in pregnant Wistar rats following the injection of elemental mercury or inhalation exposure to mercury vapor is distinctly different from the distribution observed after the administration of mercuric chloride. The blood level after elemental mercury declines more rapidly than after mercuric chloride, in that more is exhaled or taken up by tissues shortly after administration. This rule applies not only to the maternal tissues, but to those of the fetus. Following the injection of elemental mercury into the dams, the fetal mercury concentration was over 10 times greater than after an equivalent dose of inorganic mercury; following maternal inhalation, the fetal concentration was approximately 40 times greater than after an equivalent dose of inorganic mercury. The ability of the placenta to discriminate against ionic mercury was demonstrated by differences in the placental/fetal ratios, which were 80 with ionic mercury and 2.3 with elemental mercury in one group of animals (elemental mercury injected) and 122 and 1.0 in another group (elemental mercury inhaled). (Author summary)

31384 **APTIC NO. 53392**

Csallany, A. Saari

AIR POLLUTION AND AGING. *Ill. Res., Summer:3-4, 1972.*

The question has arisen as to whether the nitrogen dioxide and ozone (both highly oxidizing) is polluted air may affect lipid peroxidation and the formation of age pigments in the body. A long-term study has begun of aging and of whether antioxidants will counteract the effect. Short term studies involving rats exposed to higher levels of nitrogen dioxide in glass inhalation chambers have indicated lipid peroxidation and accelerating age pigment formation to occur under such conditions. Higher levels of biological antioxidant in the diet, however, have lowered the effects of nitrogen dioxide. The air above major U. S. cities, in contrast to unpolluted air, contains mean concentrations of 0.03, to 0.06 ppm of NO2; maximum values for O3 in the Los Angeles area have ranged up to 0.90 ppm.

31385 **APTIC NO. 53380**

Gerstner, Helga

TOXICITY ASPECTS OF SILICA OR QUARTZ PARTICLES. *Oak Ridge National Lab., Tenn., National Library of Medicine Interagency Agreement 40-274-71, 11p., Sept. 1972. 87 refs.*

NTIS: ORNL-TIP/TIRC-72-62

A bibliography of 87 sources covering the period 1960 to 1971 on the toxicity aspects of silica or quartz particles is presented based on a search of Chemical Abstracts, Toxicity Bibliography, and Cumulative Index Medicus using the search terms: dust, quartz, silica, silicates, pneumoconiosis, and silicosis.

31386 **APTIC NO. 52536**

Harger, Rolla N.

SOME TWENTIETH CENTURY POISON PANICS. *Med., Sci., Law (London), 12(2):85-88, April 1972. 5 refs.*

Arsenic poisoning in Sweden is discussed. The primary source of the arsenic was sea water, which contains a trace of this material. The study shows that the trace of arsenic in the Swedish diet is harmless and that fears of widespread arsenic poisoning in Sweden are groundless. Poisoning from tetraethyl lead in gasoline, from aluminum cooking utensils, from the trace of fluoride in drinking water and from mercury is discussed. The use of leaded gasoline in automobile engines should cause no increase in the concentration of lead in the blood or urine of high mileage drivers or filling-station operators.

31387 **APTIC NO. 52802**

Hashimoto, Y., I. Furuuchi, S. Ushijima, M. Owada, Y. Okuzawa, Y. Iwai, S. Asai, and S. Shimada

THE EFFECT OF AIR POLLUTION ON THE MUCOSA OF AIRWAYS. PART 1. RELATION BETWEEN AIR POLLUTION AND THE REACTION OF NASAL MUCOSA. *(Taiki osen no kido nenmaku ni oyobosu eikyo. Sono 1. hana nenmaku hanno tono kankei). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho (J. Japan. Broncho-Esophagological Soc.), 23(5):248. Oct. 1972.*

Air pollution modifies the airway mucosa, which then affects the development of disease. The relationship between air pollution and the reaction of the nasal mucosa and the relationship between the mucosa and the subjective complaints of respiratory illness among schoolchildren in unpolluted and polluted areas were studied. Children were studied by questionnaires and diagnostic tests. Decrease of hypersensitivity (increase of threshold value) occurred in children in both zones, especially those in the polluted zone. Adult respiratory disease patients living in a polluted area had a decrease in hypersensitivity of the nasal mucosa if they had abnormal sensations in the pharyngolarynx or bronchial symptoms. Endoscopy of the respiratory mucosa and histopathological examinations of the patients were conducted.

31388 **APTIC NO. 53004**

Hernberg, Sven and Jorma Nikkanen

EFFECT OF LEAD ON DELTA-AMINOLEVULINIC ACID DEHYDRATASE: A SELECTIVE REVIEW. *Pracovni Lekar. (Prague), 24(2-3):77-83, 1972. 43 refs.*

The effect of lead on delta-aminolevulinic acid dehydratase (ALA-D) is discussed. When lead is absorbed into the living organism, it inhibits ALA-D by binding to an allosteric site of the enzyme molecule. In humans, erythrocyte ALA-D is partially inhibited at very low lead levels such as those occurring in the urban environment. The degree of inhibition closely correlates with the concomitant level of lead in the blood (Pb-B), thus rendering the estimation of ALA-D a useful exposure test for prophylactic medicine and a qualitative tool in diagnosing lead poisoning. The sensitivity of the test can be reduced by lowering the incubation pH in the assay. The inhibition of ALA-D becomes measurable a few days after the commencement of new lead exposure, and it persists for many years following its cessation. In both cases, however, the inhibition seems to be in proportion to the concomitant Pb-B level. So far, no other agents or clinical conditions have been described which would significantly interfere with the specificity of the test for lead. The biological significance of ALA-D inhibition is not known. It may be significant that, in animals, lead also inhibits this enzyme in other tissues. The relevance of this for the synthesis of heme containing enzymes is unknown, but it has been suggested that the developing brain may be a site where the inhibition of ALA-D interferes with essential biochemical reactions. (Author abstract)

31389 **APTIC NO. 52561**

Jacobsen, M.

THE BASIS FOR THE NEW COAL DUST STANDARDS. *Mining Eng. (London), 131(138):269-279, March 1972. 23 refs. (Presented at the Southern Counties Institute of Mining Engineers, General Meeting, London, England, Dec. 21, 1970.)*

The methods used by the National Coal Board s Pneumoconiosis Field Research are reviewed. Records of exposure to airborne coal mine dust and radiographic evidence of pneumoconiosis have been accumulated since 1953 for miners employed in 25 collieries distributed throughout the British coalfields. An interim analysis of results from 4122 coal face workers after a 10-year period of observation in 20 of these pits was begun in 1967 and provided the basis for gravimetric dust standards. Research results were expressed in the form of probabilities of contracting varying degrees of pneumoconiosis after a 35-year exposure to different mean mass concentrations of respirable dust. The results were combined with information concerning the distribution of mass concentrations in England during 1967/68. The effective implementation of the new 8 mg/cu m maximum allowable concentration for longwall faces would, in the dustiest pits, reduce the long-term risk of contracting pneumoconiosis category twice or higher from about 38% to 3%; and that the incidence over 35 years starting the period without the disease would be reduced from 4% to 2%. These estimates were based on the assumption that in future the concentration at the dustiest face in a colliery will continue to be 32% higher than the mean of all face concentrations in that colliery. Possible deviations from this assumption are discussed quantitatively. (Author abstract)

31390 **APTIC NO. 52988**

Kehoe, Robert A.

OCCUPATIONAL LEAD POISONING. 2--CHEMICAL SIGNS OF THE ABSORPTION OF LEAD. *J. Occupational Med. (Ottawa), 14(5):390-396, May 1972. 12 refs. (Presented at the American Academy of Occupational Medicine, Annual Meeting, 23rd, New York, Feb. 8-10, 1971.)*

The earliest sign of the absorption of lead above normal levels is elevation of the concentration or output of lead in the urine. If the rate of absorption is sufficient and persists for a sufficient length of time, the concentration of lead in the blood will also increase. Measurements of lead levels in the blood are more precise, due to the great physiological variability in the rate of urinary excretion of lead. The generally accepted normal range of lead in the blood is 0.01-0.04 mg/100 g whole blood, the abnormal but safe range is 0.05-0.07 mg/100 g whole blood, and the potentially dangerous minimum value is around 0.08 mg/100 g whole blood. Lead poisoning is beginning to be regarded as a general intoxication through which basic metabolic processes are influenced, rather than as a clinical pattern of symptoms and signs. Severe and prolonged exposure to lead can result in chronic anemia or chronic nephritis.

31391 **APTIC NO. 53400**

Kevorkian, Jack, Donald P. Cento, John R. Hyland, Wallace M. Bagozzi, and Eunice van Hollebeke

MERCURY CONTENT OF HUMAN TISSUES DURING THE TWENTIETH CENTURY. *Am. J. Public Health, 62(4):504-513, April 1972. 16 refs. (Presented at the American Public Health Association, Annual Meeting, 99th, Minneapolis, Minn., Oct. 12, 1971.)*

Various human tissues and organs from 59 autopsy cases handled between the years 1913 and 1970 were analyzed for total mercury content, and 10 individual tissue samples were analyzed for methyl mercury concentration. Four different qualified laboratories performed the tests on essentially identical tissue samples. The results were frequently widely divergent. However, several coarse but definite trends indicate that the total mercury content of most human organs has dropped sharply during the last 60 years, and that such levels have a biphasic curve throughout the individual s lifetime. This curve involves peaks in early childhood and middle age. The sharp drop may reflect a cleansing of the general environment of mercury and a diminution of any pollution threat. The methyl mercury levels ranged from 0 to 74% of the total mercury levels, and two or three brain samples showed no methylmercury at all. (Author summary modified)

31392 **APTIC NO. 53172**

Kobayashi, Nobutoshi

EXPERIMENTAL LUNG CANCER: LUNG CANCER INDUCTION IN HAMSTERS AND DISTRIBUTION OF DUST BY INTRATRACHEAL INJECTION OF 3,4-BENZOPYRENE WITH MIXED DUST. *(Jikkenteki haigan. Haigan hassei ni taisuru kinzoku funjin no eikyo). Text in Japanese. Haigan (Lung Cancer), 12(3):145-154, 1972. 19 refs.*

Syrian golden hamsters divided into four groups by experimental design (benzo(3,4)pyrene administration alone, benzo(3,4)pyrene plus 20 mg of alumina and 2 mg of silica, alumina alone, and untreated) were given 10 intratracheal injections of the mixed dusts suspended in 0.2 ml saline to observe the effect of the carcinogenic activity of benzo(3,4)pyrene with mixed dusts and the localization patterns of tritium labeled benzo(3,4)pyrene and dusts in the lung. Lung cancer developed in 33.3% of the 15 hamsters surviving for 450 days in the first group, while the second group given the sam carcinogen with mixed dusts developed lung cancers at a larger rate of occurrence. This second group developed considerably more adenocarcinomas originating from terminal bronchi where significant amounts of dusts and silver grains persisted. There were also some squamous carcinomas originating from the metaplastic foci of the large bronchi. No tumorous activity was observed in either the third group or the controls. The cancerous change in the epithelium of the respiratory tract is due to prolonged contact between the mixed dust which might adsorb to benzopyrene and the target tissue.

31393 **APTIC NO. 52908**

Koshi, Kimiko and Hiroyuki Sakabe

EFFECT OF ASBESTOS DUSTS ON THE CULTURED MACROPHAGES. *Ind. Health (Japan), 10(1-2):16-23, Aug. 1972. 9 refs.*

Experiments were performed in order to investigate the cellular damage when asbestos particles were added to rat peritoneal macrophages in vitro. At short time after the addition of naked chrysotile, amosite, or crocidolite to the cell culture, considerable amounts of lactic dehydrogenase (LDH) were released into the medium lacking serum, and the content of acid soluble nucleotide in the cells decreased. Also C14-leucine incorporation into the cell protein was decreased by the addition of chrysotile, crocidolite, or amosite. Naked crocidolite and amosite decreased the lactic acid production after 24 hour incubation. But, when serum coated chrysotile, crocidolite, or amosite were added to the macrophages, the lactic dehydrogenase in the medium increased in small amounts only after more prolonged incubation. Serum coated asbestos had no effect on the lactic acid production and C14-leucine uptake into cell protein of macrophages in the medium lacking serum; naked asbestos had no effect in the medium containing serum. (Author abstract)

31394 **APTIC NO. 52976**

Lauwerys, R.

BIOLOGICAL DIAGNOSIS OF EXCESSIVE EXPOSURE TO LEAD. *(Le diagnostic biologique d exposition excessive au plomb). Text in French. Louvain Med., 91(1):19-30, 1972. 75 refs.*

The sources of human exposure to lead are discussed, along with the primary toxic actions of this metal, and the advantages and limitations of the various biological analyses which have been proposed for the routine monitoring of workers exposed to lead. These methods of analysis fall into two categories: exposure tests (e.g., concentration of lead in the blood, urine, or hair); and tests for toxic effects (e.g., hemoglobin level, coproporphyrinuria, and delta-aminolevulinic acid in the urine and serum). It is suggested that the determination of punctate red blood cells, as currently required under Belgian law, should be replaced by a more sensitive and specific test such as the determination of the blood or urinary levels of lead or the urinary levels of delta-aminolevulinic acid. The latter is advantageous in that it rules out any external contamination of the sample and indicates not only the quantity of lead in the organism, but also the significance of its metabolic effect. The extreme sensitivity of delta-aminolevulinic dehydrotase to the inhibitory effect of lead illustrates the importance of this metal as an environmental pollutant. (Author summary modified)

31395 **APTIC NO. 53367**

Law, Francis Chung Pak

BIOTRANSFORMATIONS BY LUNG TISSUE. *Michigan Univ., Ann Arbor, Dept. of Pharmaceutical Chemistry, Thesis (Ph.D), Ann Arbor, Mich., Univ. Microfilms, Inc. 1972, 84p. 103 refs.*

The extent and significance of the lung as a site of foreign compound metabolism were investigated using frozen lung tissue of male Sprague Dawley rats and guinea pigs. Three enzyme systems were studied in the lung: phenol-O-methyl transferase, catechol-O-methyl transferase, and benzopyrene hydroxylase. Experimental evidence indicated that these enzymes were similar to the corresponding hepatic enzymes. In addition, microsomal catechol-O-methyl transferase and soluble catechol-O-methyl transferase in the lung were quite similar to each other, probably being the same enzyme. The criteria of comparing the catechol-O-methyl transferases were pH optima, magnesium ion concentration optima, Km values, substrate specificity, and position of methylation specificity. The effects of 3-methylcholanthrene and nitrogen dioxide on the above activities were also studied. Benzopyrene hydroxylase was the only enzyme induced and only by 3-methylcholanthrene. No changes in the other enzymatic activities were detected by exposure of experimental animals to either of these chemicals. In vitro experiments indicate the lungs to be an important site of foreign compound metabolism. This should be especially true in vivo following the parental route of drug administration where the lung is the first organ through which the drug-bearing blood passes. (Author summary modified)

31396 **APTIC NO. 52837**

Maekawa, H., T. Yamazaki, K. Hasegawa, and K. Yamamoto

THE EFFECTS OF SEVERAL GASES ON THE MOVEMENT OF CILIA ON THE TRACHEA. *(Shoshu gasutai no kikan senmo undo ni oyobosu eikyo). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho (J. Japan. Broncho-Esophagological Soc.), 23(5):259, Oct. 1972.*

Inhaled gas can affect the functions of the mucosa, including movement of the mucus cilia. Rabbit cilia were studied in vitro during exposure to various gases, including oxygen, carbon monoxide, carbon dioxide, ethyl ether, fluorothane, nitrous oxide, nitrogen oxides, photochemical smog (ozone), and cigarette smoke. The recovery of the cilia movement was also observed.

31397 **APTIC NO. 52794**

Matsunaga, Ei

ENVIRONMENTAL POLLUTION AND HEREDITY - PROTECTION OF THE HEALTH OF DESCENDANTS. *(Kogai to iden-shison no kenko o mamoru tameni). Text in Japanese. Iden (Heredity), 26(5):53-57, May 1972.*

The complexity of current pollutant chemicals is a great threat to the genes of the mankind. The pool of genes (collectively speaking) is the source for the future generation, and genes can be affected by numerous mutant pollutants and carcinogens. Over 1500 diseases can be accounted for as a result of mutation of genes. Of 0.5-0.6 million known chemical compounds, which are increasing by 500 every year, those that can affect human health by way of the air are various ethylenimine pesticides and soil conditioners, Captan, Maleic hydrazide herbicides, benzo(3-4)pyrene in smog and cigarette smoke and sulfur mutative compounds also. Preventive measures include legal control, cooperation of physicians, guidance by local governing administrations, awareness of users, effective monitoring systems, and research work for counteraction against mutative compounds.

31398 **APTIC NO. 52803**

Miyoshi, Y., K. Oyama, and F. Ido

THE OBSERVATION OF MUCOSA OF THE LARYNX AND TRACHEA BY SCANNING ELECTRON MICROSCOPY. *(Koto, kikan nenmaku no sosa denkenteki kansatsu). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho (J. Japan. Broncho-Esophagological Soc.), 23(5):259, Oct. 1972.*

Ultramicroscopic structures of the mucosa of the larynx and trachea of men, mice, and rats were observed by a scanning electron microscope. Especially in rats and mice, the change of the mucosa of larynx and trachea and the accentuation of mucosal secretion were compared on the animals exposed for a long time period to sulfur dioxide of low concentrations. The secretions were in large and small amounts. Furthermore, the phenomenon of secretion from holes (outlets) was observed. The present report concerns the consideration of the microscopic pictures of the cross-section of the mucosa obtained by cutting the specimen utilizing a dryer at critical temperature.

31399 **APTIC NO. 52950**

Nagata, Minoru

EPIDEMIOLOGICAL STUDIES ON ESTIMATION OF HUMAN DAMAGES PRODUCED BY AIR POLLUTION. PART 3. STUDY ON SCHOOLCHILDREN IN AN AIR POLLUTION AREA FROM VIEWPOINT OF INCREASES IN HEIGHT AND AMOUNT OF PULMONARY VENTILATION WHICH ACCOMPANY DEVELOPMENT. *(Taiki osen ni yoru jintai higai suitei no ekigakuteki kenkyu, daisanpo: Hatesuiku ni tomonau shincho oyobi hai kankiryo zoryo no sogo no kanrenkara mita taiki osen chiiki gakudo gakudo no kento). Text in Japanese. Kita Kanto Igaku (Kitakanto Med. J.), 22(6):383-389, 1972. 10 refs.*

Schoolchildren who live in an air pollution area (principally hydrogen chloride gas) were investigated with respect to increases in height and amount of pulmonary ventilation by comparing the results of physical examination inthe 3rd and 5th school years. The subjects were born in a period from April 1960 to March 1961. Controls were children of the corresponding age, living in nonpolluted areas of the same city. The average increase in the height in the interval between the two physical examinations was not significantly different from the control values. But, the average increase in the amount of pulmonaly ventilation was significantly higher in the pollution area both in FVC and FEV 1.0. Increases in FVC and FEV 1.0 in the pollution area were largest for those who gave the smallest values in the 3rd school year. This indicated the possibility of compensatory increase in the amount of pulmonary ventilation in the pollution area. Correlation between increases in height and the amount of pulmonaly ventilation (both in FVC and FEV 1.0) was significant in the nonpollution area, whereas the correlation was not significant in either sex in the pollution area. Since, there was no significant correlation between increases in height and the amount of pulmonary ventiiation in the children of pollution area, the compensatory increase in the amount of pulmonary ventilation is assumed to show considerably larger individual differences, giving wide scatter.

31400 **APTIC NO. 52552**

Pierson, Stephen Charles

CONDITIONED SUPPRESSION TO ODOROUS STIMULI IN THE RAT. *Florida State Univ., Tallahassee, Dept. of Psychology, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., June 1972, 121p. 51 refs.*

A modified conditioned suppression technique was used to train six male Sprague-Dawley rats to criterion discrimination of amyl acetate at 0.01 of vapor saturation. The magnitude of suppression was also recorded as a function of concentration of amyl acetate, with the concentrations presented by the method of constant stimuli. Amyl acetate thresholds were 10 to the -5.50, -5.25, -5.75, -5.90, and -5.80 of vapor saturation for the subjects. Additional threshold training with larger stimuli intervals was instituted with four of the rats. The mean group thresholds 10 to the -5.16 of butyl, amyl, hexyl, and heptyl acetates were -5.28, -5.18, and -4.21 of vapor saturation. An independent measurement of the amyl acetate concentrations determined by the olfactometer was made with gas-liquid chromatography. The results indicated that for a six log unit range(1 to 0.000001 of saturation) of amyl acetate the method of producing variable concentrations by the mixing of different flow rates of odorant saturated air and water vapor saturated air is an accurate methodology to employ. (Author abstract modified)

31401 **APTIC NO. 52978**

Ramsey, J. M.

CARBON MONOXIDE, TISSUE HYPOXIA, AND SENSORY PSYCHOMOTOR RESPONSE IN HYPOXAEMIC SUBJECTS. *Clin. Sci., 42(5):619-625, 1972. 19 refs.*

Anemic patients and those having emphysema were compared with respect to carbon monoxide uptake and venous oxygen content; the effect of 5% carboxyhemoglobin (COHb) on depth perception, visual brightness discrimination, and reaction time to a visual stimulus was determined. Twenty normal subjects, 20 patients with emphysema, and 20 patients with anemia breathed 0.03% CO for 45 min. For all subjects, the mean increase in COHb was 4.5%, patients with emphysema had a significantly smaller increase than the others. The mean decrease in O2 content was 2.09 vol/100 ml and was significantly less in the patients with emphysema. All subjects showed a significant diminution in reaction speed to a visual stimulus, but no significant changes in depth perception and brightness discrimination; the three groups did not differ on these tests. The COHb concentrations of 5% may adversely affect reaction time to visual stimuli, and patients with emphysema are less susceptible to the accumulation of COHb and decreases in venous O2 than are normal and anemic subjects. (Author summary modified)

31402 **APTIC NO. 52799**

Takayama, O., F. Katano, T. Endo, M. Seto, Y. Oshio, and T. Suzuki

FINDINGS ON THY UPPER AIRWAY THOUGHT TO BE DUE TO PHOTOCHEMICAL SMOG. *(Kokagaku sumoggu ni yoru to omowareru jokido shoken ni tsuite). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho (J. Japan. Broncho-Esophagological Soc.), 23(5):246-247, Oct. 1972.*

The effects of photochemical smog on the human body are discussed. In Tokyo, smog caused various symptoms on middle school pupils, including eye irritation, tearing, throat irritation, pharyngeal ache, frequent and severe redness of the nasal, pharyngeal, and laryngeal mucosa, and other respiratory symptoms. Findings which differed from those usually occurring in air polluted areas were bleeding of the pharyngeal mucosa, tonsil bleeding, bleeding of the subglottic parts, and the pale color of the mucosa.

31403 **APTIC NO. 52800**

Takayama, O., A. Katano, and Y. Oshio

AN INVESTIGATION ON THE HOARSENESS OF SCHOOLCHILDREN IN AN AIR POLLUTED DISTRICT. *(Taiki osen chiku gakudo no sasei tsuiseki chosa). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho (J. Japan. Broncho-Esophagological Soc.), 23(5):247-248, Oct. 1972.*

The effects of air pollution on the upper airways were studied during a study of hoarseness (laryngitis) in schoolchildren living in a polluted area. The district's pollution included automobile emissions, dust, and sulfur dioxide. One out of every ten children in three districts were studied in 1971 and 1972. The pharynx, larynx, phoneticophilological sonagram, and length of hoarseness episodes were examined.

31404 **APTIC NO. 52804**

Takayama, O., F. Katano, T. Endo, M. Seto, Y. Oshio, and T. Suzuki

THE PERSONAL TRACING OF THE FINDINGS ON THE UPPER AIRWAY OF SCHOOLCHILDREN IN AIR-POLLUTED DISTRICTS, PART 3. *(Taiki osen chiku gakudo jokido shoken no kojinteki tsuiseki ni tsuite). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho (J. Japan. Broncho-Esophagological Soc.), 23(5):247, Oct. 1972.*

The pharynges and larynges of schoolchildren in industrially polluted districts and in automobile exhaust polluted districts of Tokyo were studied and compared to those of children in an unpolluted district in Saitama Prefecture. A relatively large number of abnormal findings occurred in both the polluted and unpolluted districts. No change occurred over the past two years in the pharynges of schoolchildren in the automobile exhaust polluted district; no large change occurred in the past year on the larynges, however, the findings of last year's examination were different from the year before that.

31405 **APTIC NO. 52805**

Takayama, O., T. Endo, T. Suzuki, and K. Saito

AIR POLLUTION AND THE LARYNX. *(Taiki osen to koto). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho (J. Japan. Broncho-Esophagological Soc.), 23(5):248, Oct. 1972.*

Pathohistological examinations were made of larynges of persons who died because of pulmonary silicosis. The optically polarized substance which exists in the nodes of pulmonary silicosis diseased lungs could be detected in the lungs by a polarized microscope, but could not be detected in the larynx. The change of glandular tissue was conspicuous. The biopsied specimens of 26 chronic laryngitis cases were classified as having little gland alteration, severe alteration of the glandular lobe stroma, severe alteration of glanular cells and ducts, and mixed findings. The frequency of these types were 50, 23, 15, and 8%, respectively. With pulmonary silicosis patients, the frequencies of occurrence were 9, 27, 36, and 3%, respectively. The frequency of the last two types was more than 63% with pulmonary silicosis and 23% with chronic laryngitis.

31406 **APTIC NO. 52798**

Takizawa, Yukio

POLLUTION OF WATER AND AIR, AND HUMAN HEALTH. *(Mizu ya kuki no osen to ningen no kenko). Text in Japanese. Iden (Heredity), 26(5):6-3, May 1972.*

Traditional industrial cities such as Kawasaki, Amagasaki, and Yahata have high rates of settling particles and newly developing chemical industrial cities which use petroleum fuels and cause sulfur dioxide pollution. Presently, the most polluted industrial area in Japan is Kawasaki, where the monthly average of settling particles within 1 km radius is 40 tons, and the daily average of sulfur oxides is 3 mg/100 sq cm. Chronic effects of air pollution have been noted for some time in underdevelopment of children's bodies, increase of ricket cases, inflammation of the respiratory system in general, gradual deterioration of health, and the increase of morbidity and mortality of pneumonia, bronchitis, and lung cancer. Recent reports show that the respiratory diseases of polluted-area residents and the mortality of respiratory system and circulation system patients, diphtheria morbidity, and the absence rate of schoolchildren are all closely related with the concentration of sulfur dioxide and suspended particulates of the area. For instance, morbidity of chronic bronchial inflammation and polluted Osaka and Yokkaichi is several times higher than that of control areas. Morbidity of chronic bronchitis is higher among older people, and 29.1% of all patients are male and older than 70 years. The absence rate of schoolchildren in polluted areas is higher by 1.5-3 times compared to that of nonpolluted areas. It has been reported that a high rate of lung cancer is found among smokers who live in heavily polluted areas, and that there is a correlation between chronic bronchitis and lung cancer.

31407 **APTIC NO. 53469**

Takizawa, Y., K. Sato, and Y. Nakagawa

EPIDEMIOLOGICAL STUDY OF THE EFFECT OF AIR POLLUTION ON HUMAN BODIES IN NIIGATA-CITY (SECOND REPORT). *(Niigata-shi ni okeru taiki osen no jintai ni oyobosu eikyo no ekigakuteki kenkyu, dai 2 ho). Text in Japanese. Niigata-Ken Ishikai-Ho (J. Niigata Medical Assoc.), no. 2:1-6, 1972.*

To assess the effect of air pollution on human health, 357 female residents of Niigata, aged 40 or older and living in the most polluted and the least polluted areas, were subjected to interviews and physical examinations. The residents were divided into groups aged 40-49 yrs, 50-59 yrs, and 60 yrs or older. Results of the interviews showed more complaints from residents of the polluted area on subjective symptoms such as coughing and hard breathing. The differences were more significant as the age of the group increased. However, results of the physical examinations showed no noticeable differences in the lung functions between the same age groups.

31408 **APTIC NO. 52926**

Tetsuo, Shimada, Takeshi Kitamura, Toshiro Kaneko, and Osamu Iizumi

RESULT OF INVESTIGATION ON THE EFFECT OF ATMOSPHERIC POLLUTION ON SCHOOLCHILDREN IN FUJI DISTRICT OF SHIZUOKA PREFECTURE (BY FINDINGS WITH NASAL SPECULA AND OLFACTOMETRY). *(Shizuoka-ken Fuji-chiku ni okeru gakudo no taiki osen eikyo chosa (bikyo shoken to shukaku kensa kara)). Text in Japanese. Niho Jibi Inkoka Gakkai Zasshi (Japan. J. Otolaryngol.), 70(10):1201-1203, Oct. 1972.*

Pulp and paper factories in the Fuji district of Shizuoka Prefecture contribute sulfur oxides, nitrogen oxides, carbon monoxide, and suspended particulates to the air. The yearly sulfur dioxide average concentration was 0.075 ppm in one sub-district. Odors such as dimethyl sulfide, hydrogen sulfide, and methyl mercaptan are a public nuisance. Schoolchildren (468 boys) were examined for the effect of pollution on the respiratory system by nasal specula and olfactometry. Symptoms included chronic paranasal sinusitis, chronic rhinitis, and allergic rhinitis. These diseases correlated with the polluted district. Children in polluted schools had statistically significant hypersensitivity.

31409 **APTIC NO. 53132**

Viziano, Angelo

SMOG - A FATAL HAZARD FOR WEAK AND SICK PEOPLE. *(Lo smog mortale pericolo per le persone deboli o malate). Text in Italian. Lo Smog (Italy), 1972:41-42, 1972.*

In December 1952, smog enveloped London and killed 4000 people, a level of mortality twice the normal number of dead which resulted in 2000 emergency hospital admissions against the norm of 900. In 1930 a yellow cloud in Belgium killed 63 people in the Meuse valley besides hospitalizing thousands; this episode was due to a thermal inversion which concentrated and accumulated emissions from 27 industrial establishments to a deadly mix of pollutants. While the London episode was due primarily to effluents from domestic heating furnaces, the Belgian episode was caused strictly by industrial effluents. Another such episode is that of Donora, Pa., which in 1948 killed 20 people in 4 days and sickened 43% of the population. Two years later an accidental discharge of hydrogen sulfide by a plant in Paza Rica in Mexico killed 22 people and sent 300 to a hospital. The atmosphere can become toxic without any one factor exceeding its limit of toxicity. The synergistic action is the cause. Fine droplets of fog acquire a greater penetrating power than just gases, which results in greater pulmonary accumulation of toxic substances.

31410 **APTIC NO. 53097**

Waller, R. E.

POLLUTION OF THE AIR. *Med., Sci., Law (London), 12(2):89-93, April 1972. 11 refs. (Presented at the Scientific Meeting of the British Academy of Forensic Sciences, Annual, 12th, Oct. 2, 1971.)*

Following a massive increase in the death rate which accompanied a prolonged fog in London, interest was aroused in studying the nature and effects of air pollution and in passing legislation to control it. The fog consisted of high concentrations of smoke particles, sulfuric acid droplet residues, and sulfur dioxide. Changes in the concentrations of smoke and sulfur dioxide were closely correlated with the average condition of bronchitic patients. In recent years, however, following adoption of the Clean Air Act, the conditions of these patients no longer show sudden changes and are no longer related to pollution. Along with the reduction in atmospheric smoke and sulfur dioxide has come a reduction in the hospital admissions and deaths associated with pollution. Since a prolonged fog in December of 1962, there has been little evidence of any effect of air pollution on daily changes in mortality or hospital admissions in London. Increased attention is being given to pollution from motor vehicles; there has been a substantial increase in the concentrations of smoke, carbon monoxide, and other pollutants in busy streets. While these increases have not been shown to be related to dangerous carboxyhemoglobin levels, there is widespread interest in the possible effects of the modest levels of CO which have been found. While Great Britain does not suffer from the special problems of photochemical smog, controls on vehicle pollution may become desirable in the future.

31411 **APTIC NO. 52938**

Waring, W. W.

PULMONARY FUNCTION TESTING IN CHILDREN. *Paediatrician, 1(3):152- 163, 1972/73. 3 refs.*

The use of simple tests (forced expiratory vital capacity, 1-second forced expiratory volume, and peak expiratory flow rate) is described as they are used within chest and cystic fibrosis clinics operated in a university setting. The above ventilatory tests were not used frequently to test pulmonary function because of the high equipment cost, unavailability of normal values, difficulties in interpretation, need for maximal patient cooperation, and general skepticism. Equipment improvements, recently published normal standards, and postgraduate educational efforts which might make such testing more common and acceptable are reviewed. (Author abstract)

31412 **APTIC NO. 52801**

Yamada, F. and T. Karube

THE MYCOTIC ALLERGY OF PATIENTS WITH PHARYNGOLARYNGEAL DISEASES, ESPECIALLY IN THE CONNECTION TO AIR POLLUTION. *(Inkoto shikkan kanja no shinkin arerugi ni tsuite, tokuni taiki osen tono kankei). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho (J. Japan. Broncho-Esophagological Soc.), 23(5):247, Oct. 1972.*

The relationship between mycotic (fungi) allergy and pharyngolaryngeal diseases was studied in the heavily polluted areas of Tokyo with suspended dust concentrations of 0.632 mg/cu m. Mycotic flora were studied in various locations, including four road crossing points which had more than 5000 automobiles/hr, four industrial areas which emitted smoke, gases, and odors, and two relatively unpolluted spots. An antigen test was carried out by intracutaneal reaction using extracts of housedust, ragweed pollen, and eumycete species on patients suffering from paresthesia on the throat, chronic pharyngolaryngitis, and vocal chord polyps.

1971

31413 **APTIC NO. 52589**

Balchum, Oscar J., John S. O Brien, and Bernard D. Goldstein

OZONE AND UNSATURATED FATTY ACIDS. *Arch. Environ. Health, vol. 22:32-34, Jan. 1971. 13 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 62nd, New York, June 25, 1969.)*

The effect of ozone on unsaturated fatty acids in biological membranes was investigated. Red cell fatty acids were extracted, methylated, and quantitated by gas-liquid chromatography and were exposed to 40 ppm ozone. After O3 exposure, a relative decrease in unsaturated fatty acids as compared to saturated fatty acids was determined; with loss greater, the more unsaturated the fatty acid. (Author abstract modified)

31414 **APTIC NO. 52557**

Byczkowski, S., J. Krechniak, and T. Gietazyn

AN ATTEMPT TO EVALUATE EXPOSURE TO FLUORIDES BASED UPON FLUORIDE LEVELS IN HAIR. *Fluoride, 4(2):98-100, April 1971.*

The relationship between fluoride exposure and fluoride levels in hair was investigated using three groups of subjects. Group one constituted the control group and were residents of an area with no exposure to fluoride. Group two were residents in an area where the drinking water contained 1.2 mg F/l. Group three consisted of welders with occupational exposure to fluorides. Based on tests of all three groups, a direct relationship between the fluoride levels in hair and their concentration in air and drinking water was determined.

31415 **APTIC NO. 53158**

Einbrodt, Hans-Joachim

THRESHOLD VALUES FOR DUST-SHAPED AIR POLLUTING SUBSTANCES AND OTHER CAMPAIGN MEASURES. *(Grenzwerte fuer staubfoermige Luftverschmutzungsstoffe und andere Bekaempfungsmassnahmen). Text in German. Zentralbl. Bakteriol., Parasitenk. Infektionskr. Hyg.:Abt. 1:Orig., Reihe B, no. 155:296-299, 1971.*

General problems of the setting of threshold values for particulate air pollutants are discussed with special regard to VDI proposals. Detection of air pollutants along with their emission sources, studies of the biological effects on man, animals, and plants of commonly occurring concentrations of such pollutants and their simulated mixtures, as well as epidemiological surveys, constitute the individual steps towards the determination of threshold concentrations. According to a VDI proposal, technical dusts are classed into four groups regarding harmfulness. Dusts with acute toxicity, such as arsenic, asbestos, beryllium, cadmium, and hexavalent chromium compounds, have a threshold concentration set at 20 mg/N cu m. The threshold for hazardous dusts, such as soluble compounds of barium, iodine and its compounds, tellurium, quartz, and tungsten carbide, is set at 50 mg/N cu m. Manganese compounds, molybdenum, aluminum carbide, calcium oxide, and basalt dusts, harmful to a limited number of biological groups, have a threshold value set at 100 mg/N cu m. The threshold concentration for such rather inert dusts as gypsum, iron oxide, potassium compounds, dolomite, and titanium, is 150 mg/N cu m.

31416 **APTIC NO. 52975**

Gothe, C. J., L. Lidstrom, and A. Swensson

INFLUENCE OF MODE OF DISINTEGRATION ON THE FIBROGENETIC POWER OF QUARTZ PARTICLES. *Med. Lavoro (Milan), 62(8-9):375-377, Aug.-Sept. 1971. 5 refs.*

To determine whether the increased reactivity induced by the rapid dry crushing of quartz particles affects the fibrogenetic power of the particles, quartz particles from two different samples were injected intratracheally into rats. One sample (P 1001) was produced by rapid disintegration. and the other (P 9) was prepared by sedimentation in water. The rats were killed 1, 2, 4, or 8 months after injection, their lungs weighed, and the L-hydroxyproline content of the lungs determined. Both the weight and L-hydroxyproline content of the lungs were significantly higher in the animals given P 1001, regardless of time of sacrifice. Thus, rapidly disintegrated quartz particles have a more pronounced fibrogenetic power than quartz particles produced by sedimentation. This difference might be due to the lattice disruption on the surfaces of the particles and the marked change in their physical properties caused by rapid disintegration.

31417 **APTIC NO. 52984**

Hemphill, F. E., M. L. Kaeberle, and W. B. Buck

LEAD SUPPRESSION OF MOUSE RESISTANCE TO SALMONELLA TYPHIMURIUM. *Science, 172(92):1031-1032, June 4, 1971. 11 refs.*

Mice were treated with subclinical doses of lead nitrate for 30 days. Lead-treated mice showed greater susceptibility to challenge with Salmonella typhimurium than controls which received no lead. The results confirms that the hypothesis that treatment with lead reduces the resistance of mice to bacterial infection. (Author abstract)

31418 **APTIC NO. 53407**

Lowrimore, G. R., D. C. Calafiore, A. A. Cohen, C. G. Hayes, R. G. Ireson, D. M. Harris, M. Camp, S. Morrow, and P. B. Peacock

ACUTE RESPIRATORY DISEASE RISK AND URBAN AIR POLLUTION. *Preprint, American Public Health Assoc., 30p., Oct. 1971. (Presented at the American Public Health Association, Annual Meeting, 99th, Minneapolis, Minn., Oct. 11-15, 1971.)*

Comparisons of crude rates of acute respiratory illness in three sectors of New York lead to the conclusion that there is very likely an increased risk of disease in areas of elevated sulfur dioxide-total suspended particulates exposure. Similarities in the mean values of covariates make it unlikely that a more refined analysis will alter this conclusion. A three city comparison of Greensboro, Charlotte, and Birmingham, residential areas with varying total suspended particulates exposure, indicates a much more unclear picture, and important differences in covariates would make conclusions premature until a more detailed analysis has been performed to account for the covariates. The first sector for the three Southeastern cities, which is the high socio-economic sector, shows a definite gradient of illness rates for parents with some reversals for children. The same holds true for a second sector, but the lower socio-economic group reports illness rates for the high total suspended particulates city which are lower than those reported for both other cities. The nonrespiratory illness rates are higher in Greensboro and Charlotte for all three sectors.

31419 **APTIC NO. 53360**

Rowlands, John R. and Emily M. Gause

REACTION OF NITROGEN DIOXIDE WITH BLOOD AND LUNG COMPONENTS. *Arch. Internal Med., vol. 128:94-100, July 1971. 15 refs.*

The reaction of nitrogen dioxide with blood and lung components was investigated through electron spin resonance studies. In vivo exposure of small animals to NO2 and cigarette smoke are interpreted in terms of pollutant reaction with the heme moiety of hemoglobin. Results imply that the pollutants migrated through the erythrocyte membrane. The interaction of nitrogen dioxide with unsaturated lipids was studied to understand the effects of these pollutants upon the membranes themselves. Three stable radicals were characterized as products of these reactions; and a short lived initial free radical was observed whose structure provides evidence as to the initial reaction site and mechanism. A stable free radical species with 13.4 gauss 14N hyperfine coupling was produced in aqueous solutions of tryptophan by exposure to less than 5 ppm levels of NO2. Nitrogen dioxide reacts with serum albumin in aqueous solutions to quench the fluorescence of the tryptophan residues of the protein. (Author abstract modified)

31420 APTIC NO. 53157

Schuetz, Alfred

THE MAXIMUM ALLOWABLE CONCENTRATION OF FINE QUARTZ DUST UNDER THE CONDITIONS OF SURFACE INDUSTRIES. *(Der MAK-Wert fuer Quartzfeinstaub unter dem Gesichtspunkt der Verhaeltnisse in der obertaegigen Industrie). Text in German. Staub, Reinhaltung Luft, 31(11):443-448, Nov. 1971. 25 refs.*

General medical and epidemiological substantiation of the 1971 maximum allowable concentration of quartz including cristobalite and tridymite in fine dust in surface industries such as stone, building, ceramic, and iron and steel industries, is presented. The quartz content fine dusts generated in the stone and building industry, the ceramic industry, and the iron and steel industry are in the respective ranges of 5-35%, 10-15%, and 5-10% by weight. The latency period preceding the clinical manifestation of silicosis (35 to 40 years in porcelain workers, and below 30 years in foundry workers) is a function of the dust concentration. The risk function, i.e., the relationship between silicosis incidence among professionally exposed groups, and the intensity and duration of such exposure, can be determined by epidemiological investigations, and by post mortem examinations for the substantiation of a maximum allowable workplace concentration of fine quartz dust. Strong decline in the incidence of silicosis due to exposure to quartz concentrations below 0.1 mg/cu m in the porcelain industry and elevated incidence value for foundries with quartz dust concentrations exceeding 0.2 mg/cu m were determined. The medically substantiated maximum allowable workplace quartz dust concentration has now been set at 0.15 mg/cu m.

31421 APTIC NO. 52977

Valic, Fedor and Dunja Beritic Stahuljak

CHRONIC BRONCHITIS IN BAKERS. *(Kronicni bronchitis u pekara). Text in Yugoslavian. Lij. Vjesn., 93(7):739-748, 1971. 32 refs.*

The prevalence of chronic bronchitis was assessed among 322 bakers (45.17% smokers and 24.2% nonsmokers) and 699 control workers of similar age and height distribution (22.7% smokers and 6.0% nonsmokers). Although the mean airborne dust concentrations were not high (the geometric mean of total dust concentrations was 1.85 mg/cu m and the mean of the respirable fractions was 1.13 mg/cu m) in the bakeries, the incidence of chronic bronchitis was considerably higher among the bakers than among the controls. The incidence of dyspnea and chest wheezing was also significantly higher among the bakers than among the controls, irrespective of smoking habit. The forced respiratory volume in one second, peak expiratory flow, and forced vital capacity were highly significantly reduced in the bakers compared with the controls among nonsmokers, as well as among mild, medium, and heavy smokers. In addition, the ventilatory capacity was reduced in bakers with and without chronic bronchitis.

31422 APTIC NO. 52544

Zavon, Mitchell R.

INTERACTIONS. *In: Pollution. Foundations for Today. Robert S. Leisner and Edward J. Kormondy (eds.), Vol. 2, Dubuque, Iowa, Wm. C. Brown, Co., 1971. p. 37-41. 28 refs.*

The interactions of those chemicals which are classified as environmental pollutants are reviewed. The biological effects of food constituents, food additives, pesticides, drugs, industrial chemicals in water and air, and noise are discussed. The impact of DDT, sulfur dioxide, carbon monoxide, nitrogen oxides, ozone and lead on human and animal organisms is considered. The interactions have been shown to be synergistics, additive, or to cancel out each other, thus it is impossible to predict overall effects with any degree of certainty.

1970

31423 APTIC NO. 52588

Davis, J. M. G.

THE LONG TERM FIBROGENIC EFFECTS OF CHRYSOTILE AND CROCIDOLITE ASBESTOS DUST INJECTED INTO THE PLEURAL CAVITY OF EXPERIMENTAL ANIMALS. *Brit. J. Exp. Pathol., vol. 51:617-627, Dec. 1970. 17 refs.*

The fibrogenic effects of chrysotile and crocidolite asbestos dust injected into the pleural cavities of experimental animals were studied. In guinea pigs, both dusts produced granulomas that consisted mainly of giant cells, mixed with a few macrophages and fibroblasts, and eath granuloma was surrounded by a distinct capsule of fibrous tissue. In mice and rats, however, relatively few giant cells were present in the asbestos granulomas, and the lesions consisted of macrophages with some fibroblasts. In these two species, the granulomas were not surrounded by a distinct capsule. In all cases, the granulomas were evantally replaced by masses of fibrous tissue, but the time sequence of this change was variable. (Author summary modified)

31424 APTIC NO. 52619

Kaut, Vladimir

EFFECTS OF LONG-TERM NITROGEN OXIDES INHALATION IN THE ANIMAL EXPERIMENTS. *(Ucinky dlouhodobeho vdechovani kyslicniku dusiku v pokusu na zvireti). Text in Czech. Cesk. Hyg. (Prague), 15(4/5):147-153, 1970. 124 refs.*

Literature references on long-term effects of the inhalation of low concentrations of nitrogen oxides by experimental animals were reviewed. The changes induced can include the formation of nitrosamines with their carcinogenic effects, changes in acidity as a result of acid formation from NOx, oxidative effects stemming from the formation of lipoperoxides, the formation of biologically active nitrite ions with possible mutagenic effects, and oxidation of hemoglobin. The NOx acts primarily as an irritant on respiratory passages; the most noticeable change is the increase in the volume and weight of the lungs. Pulmonary functional changes involve increased respiratory frequency beginning with 0.8 ppm NOx, and increased respiratory resistance. Impaired epithelial activity reduces resistance to infection; enzymatic activity of some enzymes (LDH) is likewise reduced; the total protein content in the blood increases with an increase in the level of globulins; and a decrease in the level of albumin begins with a concentration of 2.5 ppm NOx. The total organism responds to NOx by spontaneously reduced mobile activity (7 ppm), by reduced performance (3.5 ppm), and by loss of weight (10 ppm) or at least by reduced weight gains (2.5 ppm).

31425 APTIC NO. 53419

Laskey, J. W., L. R. Simmons, and M. L. Shore

PRECURSOR AMINO ACID POOLS, LABELED AMINO ACID INCORPORATION INTO PROTEIN AND PROTEIN SYNTHESIS IN IRRADIATED FETAL RATS. *Preprint, National Environmental Research Center, Research Triangle Park, N. C., Experimental Biology Lab., 28p. 1970 (?). 7 refs.*

The effect of X-irradiation on the incorporation of labeled phenylalanine into protein and on the precursor amino acid pool size was studied in vivo and in vitro (using a cell-free system) using fetal Sprague-Dawley rats of both sexes. The in vivo incorporation of labeled phenylalanine decreased following irradiation on the thirteenth day of gestation. Phenylalanine incorporation into the acid insoluble fraction of a cell-free system derived from fetal homogenates decreased to a greater extent than was observed in vivo. To relate radiation associated differences in amino acid incorporation to differences in protein synthesis, estimates of amino acid precursor pools were obtained using an amino acid pool dilution technique. The results indicated that the significant decrease in labeled amino acid incorporation following X-irradiation of the fetal cell-free system was a result of decreased protein synthesis, since no change in the phenylalanine pool was observed. (Author summary modified)

31426 **APTIC NO. 53405**

Mahler, Delmar J., Arthur F. Scott, John R. Walsh, and Gordon Haynie

A STUDY OF TRACE METALS IN FINGERNAILS AND HAIR USING NEUTRON ACTIVATION ANALYSIS. *J. Nucl. Med., 11(12):739-742, 1970. 13 refs.*

The concentrations of manganese, copper, gold, zinc, and sodium in the fingernails and hair of 18 dialysis patients and 13 controls were measured by means of neutron activation analysis. The patients on hemodialysis had lower copper, sodium, and gold concentrations in their fingernails, and increased manganese and zinc concentrations; the hair samples showed minimal differences. A comparison of these data with those from previous studies reveals an apparent difference between groups of different geographical origin. The influence of the environment, in terms of soil and water minerals, probably plays a role in these differences. Although certain diseases influence metal metabolism in specific tissue sites, an overall or more general effect seems to result from environmental differences. These environmental differences could possibly enhance or, in some cases, antagonize the effect of disease on metal metabolism. (Author summary modified)

31427 **APTIC NO. 53395**

Menzel, Daniel B.

TOXICITY OF OZONE, OXYGEN, AND RADIATION. *Ann. Rev. Pharmacol., vol. 10:379-394, 1970. 87 refs.*

The toxicity of ozone, oxygen, and radiation are reviewed with emphasis in the molecular events occurring at the cellular level. The evidence for lipid oxidation in radiation and oxygen toxicity indicates that many of the common effects may be related through their action on the unsaturated lipids of cell membranes. Dissimilarities, where they exist, are probably associated with the differences in the efficiency of these agents at specific sites. Comparison of the radiation equivalents of chromosomal breakage by ozone and radiation shows that ozone is less efficient since it does not penetrate the cell interior as well as radiation. Where sufficient details are known and the balance of lipid versus aqueous phase-generated free radicals is the same, there are marked similarities between all three agents. The increasing concentration of ozone and other oxidants such as nitrogen dioxide and peroxyacetyl nitrate in the atmosphere from pollution may demonstrate new symptoms of the overall phenomenon of vitamin E (antioxidant) deficiency. Air pollution induced emphysema and other obstructive respiratory diseases may occur in greater prevalency because of the peroxidation of lung lipids by ozone and other air pollutants.

31428 **APTIC NO. 52637**

Parkhurst, Lawrence J., Giuseppe Geraci, and Quentin H. Gibson

KINETICS OF THE REACTION OF HYBRID-HEME HEMOGLOBINS WITH CARBON MONOXIDE. *J. Biol. Chem., 245(16):4131-4135, Aug. 25, 1970. 22 refs. (Presented at the Federation of American Societies for Experimental Biology, Annual Meeting, 52nd, Atlantic City, N. J.)*

The reaction kinetics of the hybrid-heme hemoglobin system with carbon monoxide were studied. The hybrid-heme hemoglobins, in which one chain contains meso or deuteroheme and the other chain contains protoheme, react with CO at a slow rate characteristic of reduced hemoglobin rather than quickly reacting hemoglobin, but at a rate at the protoheme site that is somewhat faster than in all-proto hemoglobin. The rate at the mesoheme site is essentially the same as for protoheme; for deuteroheme, the rate is about 50% faster. A mechanism in which the two hemes react similarly and at random with CO was postulated. In experiments with intermediate complex II, a hemoglobin with hemes only in the alpha chain, the rapid combination rate similar to that of the quickly reacting hemoglobin was slowed to that characteristic of reduced hemoglobin upon addition of various porphyrins to the beta chain heme site. (Author summary modified)

1969

31429 **APTIC NO. 53417**

Bencko, V. and K. Symon

DYNAMICS OF ARSENIC CUMULATION IN HAIRLESS MICE AFTER PERORAL ADMINISTRATION. *J. Hyg., Epidemiol., Microbiol., Immunol. (Prague), vol. 13:248-253, 1969. 17 refs.*

The dynamics of arsenic accumulation in the skin and liver of hairless mice were studied following its administration in drinking water. In the first experiment, 250 mg arsenic/kg/l was administered in the form of white arsenic; this constituted an assumed daily dosage of 10 to 15 mg/kg. The experiment lasted 32 days. In a second experiment, lasting 256 days, mice were administered arsenic in concentration of 5 or 50 mg/l (assumed daily dosages of 0.8 to 1.0 mg/kg or 4 to 8 mg/kg). In both cases, the maximum concentration was reached on about the 16th day of the experiment, with an ensuing decrease in the arsenic concentrations of the skin and liver (to reach the levels of the fourth day) being observed; this was particularly evident in the long term experiment. It was not possible to quantitatively determine the arsenic concentration by the analytical method used when an arsenic concentration of 5 mg/l of drinking water was used. Two mechanisms might be responsible for the decrease in arsenic concentration following the 16th day of administration: a decrease in arsenic absorption; or an increase in the capacity of its elimination mechanisms. (Author summary modified)

31430 **APTIC NO. 53418**

Bencko, V. and K. Symon

SUITABILITY OF HAIRLESS MICE FOR EXPERIMENTAL WORK AND THEIR SENSITIVITY TO ARSENIC. *J. Hyg., Epidemiol., Microbiol., Immunol. (Prague), vol. 13:1-6, 1969. 27 refs.*

Hairless mice were selected as the most suitable experimental animals for the study of the dynamics of arsenic accumulation following its ingestion of drinking water or inhalation of it as a solid aerosol. One hundred mice were divided into two groups, one of which received 50 mg of arsenic/l of drinking water for 3 months: the other group received no arsenic treatment. The LD50 of the arsenic treated mice was greater than that of the control mice following the subcutaneous administration of arsenic in saline. This finding appears to be at variance with the hypothesis that resistance to arsenic, as developed during its per administration, does not mean any increase in resistance to the parenteral administration of the element. (Author summary modified)

1967

31431 APTIC NO. 53372

Bobb, Gustavius A. and Edward J. Fairchild

NEUTROPHIL-TO-LYMPHOCTYE RATIO AS INDICATOR OF OZONE EXPOSURE. *Toxicol. Appl. Pharmacol., no, 11:558-564, 1967. 14 refs. (Presented at the Society of Toxicology, Annual Meeting, 6th, Atlanta, Ga., March 25-26, 1967.)*

Readily measurable differences in the neutrophil/lymphocyte (N/L) ratios were demonstrated to occur in rats exposed to 3 ppm ozone for 2 hours. The N/L ratio differences occurred within a few hours after exposure, reached a maximum within 2.5 to 12 hours, and returned to preexposure values in 24 hours. The sensitivity (3 ppm) of the response in such as to recommend the test as a simple, early indicator of overexposure to ozone. The results indicate that the response is concentration dependent, rather than exposure dependent. (Author abstract)

1966

31432 APTIC NO. 53371

Dixon, J. R., W. D. Wagner, T. D. Martin, R. G. Kennan, and H. E. Stokinger

METAL SHIFTS AS EARLY INDICATORS OF RESPONSE FROM LOW-GRADE PULMONARY IRRITATION. *Toxicol. Appl. Pharmacol., vol. 9:225-233, 1966. 13 refs.*

Preliminary studies designed to determine whether the metal content of critical organ sites is latered following brief exposure to a pulmonary irritant were conducted. The copper content in the lungs of rats exposed to ozone at 3 ppm for 4 hr was consistently greater than that in the lungs of control rats. In the exposed lungs, zinc was also significantly increased 20 hr after the exposure. Molybdenum showed less consistent changes in the exposed lungs. Depending upon the magnitude of the metal shifts in the lung, metal shifts occurred or did not occur in the liver. The glutathione content of the lungs of rats exposed to ozone under similar conditions increased 3 hr after exposure, and then decreased to normal values 20 hr after exposure. These findings suggest that copper may act as a catalyst for the oxidation of glutathione by ozone during the lung injury process. If subsequent studies confirm the preliminary findings of this study, metal shifts in organs may prove to be early indicators of the injury process from pulmonary irritants, and lead to new insight into the mechanism of edemagenesis. (Author summary modified)

31433 APTIC NO. 52618

Mathews, Donald Francis

RESPONSE PATTERNS OF SINGLE UNITS IN THE OLFACTORY BULB OF THE UNANESTHETIZED, CURARIZED RAT TO AIR AND ODOR. *Brown Univ., Providence, Rhode Island, Dept. of Psychology, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., June 1966, 68p. 58 refs.*

Neural spike activity was recorded from 56 single units in the olfactory bulb of unanesthetized, curarized rats by means of indium-filled, platinum-black plated micro-pipettes. A dilution-type olfactometer provided a continuous stream of cleaned air to which a specified volume of odorant might be added. A battery of 24 odorants in plastic puff bottles was used to test the sensitivity characteristics of the units. Each neuron of the group of 33 which responded to odors possesses a unique set of stimuli to which it will respond; the classification of odor sensitivity is best described by a matrix which shows the responses of the units by odorants. The number of effective odorants is an increasing function of the number of units sampled, and in the case of facilitory units, this is a nearly linear function. Two units stimulated with a log concentration series exhibited an approach to asymptote at high stimulus concentrations. The response of the third facilitory unit was virtually linear and the fourth, dome-shaped. The duration of inhibition increased with concentration and with flow rate. Two units which responded to odorants also responded with facilitation to cleaned air at flow rates within the rat s normal range. One unit, inhibited by cleaned air, did not respond to any of the odorants in the battery. The inhibition increased in duration as a function of flow rate. Bulbar sections were stained with Cresyl echt violet or Sudan black. Eight of the ten facilitory units lie in the more peripheral portions of the bulb. Inhibitory units and those showing combined facilitation and inhibition are homogeneously distributed throughout the bulb s dorsoventral extent. Responding and non-responding units are also homogeneously distributed in this plane. (Author summary modified)

1962

31434 APTIC NO. 52638

McFee, Donald Ray

ADSORPTIVE CHARACTERISTICS OF DUSTS AND FUMES -- THEIR POSSIBLE ROLES IN TISSUE REACTIONS. *Cincinnati Univ., Ohio, Inst. of Industrial Health, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1962, 93p. 55 refs.*

The role of adsorptive properties in the interactions of particles with tissues and the causation of fibrotic processes was investigated with respect to the adsorptive characteristics of dusts and fumes. Globulins in varying concentrations were subjected to adsorption upon a series of dusts. The value of a constant was determined as an index of strength of the adsorptive bonds for 14 different dusts, including forms of silica (quartz, cristobalite, and silica gel), charcoal, graphite, kaolin, emery, Georgia clay, asbestos, beryllium oxide, ferric oxide, calcium fluoride, and mixtures of dusts and fumes collected from an electrometallurgical plant. The dusts known to be less active in eliciting the production of fibrous tissue were at either end of the spectrum, i.e., had either very weak or very strong bonds. Those known to be active in fibrotic processes were in the middle. The selectivity of the adsorptive sites for certain properties was also investigated. All dusts adsorbed selectively certain groups of proteins, but the differences were not correlated with the biological activity. (Author summary modified)

1961

31435 APTIC NO. 53141

VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany), Kommission Reinhaltung der Luft

PERMISSIBLE IMMISSION CONCENTRATIONS OF SULPHUR DIOXIDE. *(Maximale Immissions-Konzentrationen (MIK) Schwefeldioxyd). VDI (Ver. Deut. Ingr.) Richtlinien, no. 2108, Nov. 1961. 26 refs. Translated from German. Joint Publications Research Service, Washington, D. C., APTD-1478, 19p.*

NTIS: PB 221244-T

Sulfur dioxide is produced by the oxidation of sulfur and sulfur-containing compounds in many technical processes and acts as an irritant gas of pungent odor primarily on the membranes of the nose, throat, and respiratory tract of man and animals. Human exposure to concentrations of about 100 cu cm/cu m results in strong irritation of the mucosa, a consequent immediate interruption of respiration, and sometimes spasms of the glottis which may produce acute asphyxiation under intensive exposure. Inflammatory swelling of the mucosa and muscular spasms of the bronchi, as well as possibly laryngeal edema will result if appreciable amounts of SO2 enter the median and lower respiratory tracts. Permissible concentrations established for continuous and intermittent exposure are respectively 0.2 cu cm/cu m of air and 0.3 cu cm/cu m of air; the permissible work station concentration is 5.0 cu cm/cu m. The chemical s effects on animals vary among different species; and, in general, older animals are more resistant than younger animals. Different plant species also possess different degrees of resistance to SO2. Coniferous plants, the butterfly-blossom fodder plants, and the cereals are among the most sensitive.

196E

31436 **APTIC NO. 53126**

VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany), Kommission Reinhaltung der Luft

PERMISSIBLE IMMISSION CONCENTRATIONS OF HYDROGEN SULPHIDE. *(Maximale Immissions-Konzentrationen (MIK-Werte) Schwefelwasserstoff). VDI (Ver. Deut. Ingr.) Richtlinien, no. 2107, April 1960. 35 refs. Translated from German. Joint Publications Research Service, Washington, D. C., APTD-1477, 17p.*

NTIS: PB 221243-T

Hydrogen sulfide, a waste product from such industries as mining and coal processing, chemical installations, mineral oil industry, metal smelters and foundries, vegetable processing plants, and animal processing facilities, is a gas with objectionable odor and high toxicity over a large range of concentrations. The chemical in gaseous form enters the human body primarily by way of the respiratory tract, acts as a cell and/or enzyme toxin, and can produce irreversible damage in the nerve tissue. High concentrations frequently produced death abruptly by paralysis of the respiratory center. Tolerance of H2S in the toxicological meaning does not exist, and injury to health through concentrations below the olfactory threshold is not definitely known. It is probable that a slight excess above the limit of 0.15 mg/cu m is without risk. Permissible concentrations based on the guide values of the effect on man are 0.15 mg/cu m as a half-hour mean value for continuous exposure and 0.3 mg/cu m as a half-hour mean three times daily for intermittent exposure. The permissible occupational concentration is 30 mg/cu m. Hydrogen sulfide produces the same manifestations of sickness in domestic animals as in man, while plants are believed to be somewhat less sensitive. Some of the more sensitive plants are: tobacco, radish, poppy, soybeans, clover, salvia, cosmea, gladioli, and, under exposure for a prolonged period to 48-80 mg/cu m, tomatoes, radish, cucumber, buckwheat, asters, and salvia.

31437 **APTIC NO. 53139**

VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany), Kommission Reinhaltung der Luft

PERMISSIBLE IMMISSION CONCENTRATIONS OF CHLORINE GAS. *(Maximale Immissions-Konzentrationen (MIK) Chlor). VDI (Ver. Deut. Ingr.) Richtlinien, no. 2106, Sept. 1960. 13 refs. Translated from German. Joint Publications Research Service, Washington, D. C., APTD-1476, 15p.*

NTIS: PB 221190-T

Chlorine, a chemical produced in large amounts and utilized in many technical installations, is a tissue poison having a special alarm stimulus because of its highly irritant action, especially on the respiratory tract. Its production is effected by electrolysis of alkaline chloride solutions, aqueous hydrochloric acid, and liquid chlorides; and it is utilized for the production of chlorinated hydrocarbons, plastics, bleaching agents, and hydrogen chloride. Leakages of chlorine are generally counteracted by water spray since the hydrolyzing action of the water favors its absorption. Exposure to 150 mg/cu m for 30 min to 1 hr is fatal to humans, and 60 mg/cu m may endanger life at an exposure of less than 30 min. Concentrations as low as 3 mg/cu m may create disturbance and objective symptoms of irritation in unaccustomed subjects. A chlorine content of 5 mg/cu m is generally still tolerable for animals; they become sick from 180 mg/cu m and are killed quickly by 1800 mg/cu m. Because of the minor importance of chlorine in determining smoke damage to plants, only a few experimental findings exist so far.

31438 **APTIC NO. 53432**

VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany), Kommission Reinhaltung der Luft

PERMISSIBLE CONCENTRATIONS OF NITROUS GASES. *(Maximale Immissions-Konzentrationen (MIK) Nitrose Gase). VDI (Ver. Deut. Ingr.) Richtlinien, No. 2105, May 1960. 12 refs. Translated from German. Joint Publications Research Service, Washington, D. C., APTD-1475, 12p. (Presented at the National Conference on Air Pollution, Dec. 10-12, 1962, Washington, D. C.)*

NTIS: PB 221255-T

Nitrous gases (nitric oxide, nitrogen dioxide, nitrous anhydride, and dinitrogen tetroxide) are lung and blood poisons. Industrially, nitrogen oxides are produced principally in the manufacture and processing of nitric acid (production of fertilizers, nitration processes, production of sulfuric acid by the lead-chamber process, metal pickling, and decomposition processes); in diazotization and nitrosification processes; and in combustion (internal combustion engines, explosives, and celluloid)). Nitrogen dioxide forms the main share of the NOx mixed in air under customary conditions. The primary carriers of the toxic action of NOx are NO2 and N2O4 which cannot be differentiated toxicologically because of their joint action. Acute intoxication by high concentration produces necrosis and inflammatory changes in the mucosa of the respiratory tract of man; after a latent period of several hours, an interstitial and alveolary pulmonary edema frequently occurs which may lead to death through the consequent interference with oxygen supply and circulation. Furthermore, the formation and absorption of nitrite causes an enlargement of the blood vessels in man and in animals and the conversion of a part of the blood pigment into methemoglobin which is no longer able to transport oxygen. The permissible concentration for continuous human exposure is 1 mg NO2/cu m and for intermittent exposure 2 mg/cu m taken as a half hour mean value three times per day. The permissible occupational concentration is 10 mg NO2/cu m. The effect on plants is mentioned.

1959

31439 **APTIC NO. 53359**

Goetz, Alexander and Noel Tsuneishi

BACTERIOLOGICAL TEST FOR AIR-BORNE IRRITANTS. *Ind. Eng. Chem., 51(6):772-774, June 1959. 7 refs.*

A bacteriological test for measuring physiological irritation caused by air pollutants is described. A membrane culture technique is utilized which allows exposure of a single cell layer without the chemical protection by its nutrient environment to the irritant. The apparatus consists of a rotary impactor consisting of a slowly rotating cylindrical drum containing the bacterial cell deposit on I-strips. The total impacted air volume is 40 (120) l (1.4 (4.2) cu ft) evenly distributed over a membrane area of 5.2 sq cm resulting in a maximum concentration factor of 7.7 (23) l/sq cm (1.7 (5.2) cu ft/sq in.). The normal flow rate was 6 to 7 l/min. The test was used in synthetic aerosols as indicator for the degree of association of the irritant gas formaldehyde with airborne particulate matter, by comparative tests prior to and after passage through the aerosol spectrometer. The assumption that a fraction of the irritant gas molecule associates with the particulate surface is supported and this association produces an intensifying (synergistic) effect which increases with aerosol concentration. The synergistic effect parallels the pattern of Amdur s tests with guinea pigs, and apparently those of LaBelle with regard to paraffin oil aerosols in analogy with latex dispersions. (Author conclusions modified)

1938

31440 **APTIC NO. 53119**

Calvery, Herbert O., Edwin P. Laug, and Herman J. Morris

THE CHRONIC EFFECTS ON DOGS OF FEEDING DIETS CONTAINING LEAD ACETATE, LEAD ARSENATE, AND ARSENIC TRIOXIDE IN VARYING CONCENTRATIONS. *J. Pharmacol., vol. 64:364-387, 1938. 29 refs.*

The chronic effects of dietarily administered lead acetate, lead arsenate, and arsenic trioxide on young and mature dogs were studied. There was no difference in the toxicity of lead acetate and lead arsenate, and the animals demonstrated a low susceptibility to chronic arsenic toxicity, presumably because arsenic was not stored in the body in significant quantities. Lead was retained in the greatest quantities in the skeletal framework, with the kidneys and liver also showing high retention. The lead concentration in the milk and newborn pups of dogs receiving lead was significantly elevated over those of control dogs. Of 20 dogs given lead, 15 died of severe lead intoxication; they survived from 15 to 229 days following commencement of the lead treatment. Young animals were much more susceptible to lead intoxication than mature animals. The lead retention of one dog given twice as much calcium as its litter mate was less than half that of the latter. While the former showed practically no signs of injury, the latter died of severe lead intoxication. (Author summary modified)

EFFECTS-PLANTS AND LIVESTOCK

1973

31441 **APTIC NO. 52771**

Tokyo Metropolitan Environmental Protection Research Inst. (Japan)

THE MECHANISM OF FORMATION OF THE TOKYO SMOG-A STUDY ON DAMAGED PLANTS. *(Tokyo sumoggu seisei kijo shokubutsu higai ni kansuru chosa kenkyu no gaiyo). Text in Japanese. 52p., April 1973.*

The intimate relationship between oxidant concentration, which is used as the photochemical smog index and the nitrogen oxide and hydrocarbon concentrations was confirmed in Tokyo. Approximately half of the hydrocarbons in the Tokyo atmosphere are methane and in the other half that contribute to the smog formation, 10% are unsaturated hydrocarbons, 50% are aromatic hydrocarbons and 40% are saturated hydrocarbons. Investigations at some 120 farms and parks revealed that crops in Tamagawa valley, Arakawa valley, Edokawa valley, and the outskirts of Tokyo and plants in all the parks were injured by smog. The resistance of plants to oxidants was tested in a glass chamber, and the results showed that crops, grasses, and flowers were generally weak in an ozone atmosphere, whereas trees were much stronger.

31442 **APTIC NO. 52776**

Arai, Masao

EVALUATION OF OLD AND FAMOUS TREES IN THE METROPOLITAN TOKYO. *(Tokyo-to ni okeru roju meiboku no katsuryoku hyoka ni tsuite). Text in Japanese. In: Study on Animals and Plants as Human Environmental Indices under Urban Environment. Japan Environmental Agency, p. 58-72, March 1973. 16 refs.*

The old and rare trees that are officially designated as natural treasures by the government, prefecture, cities, or townships in the greater Tokyo area were studied for the evaluation of tree conditions in the light of air pollution. The measurements of the trunks were taken at 1.2 m above the ground, the heights were estimated; and the general conditions, shapes, branch lengths, damages on the tips of small branches, damages on the trunks, density, the shape of the leaves, the size of the leaves, the color of the leaves, and necrosis were observed. An evaluation index was given to each item and a classification of A to C was given to each tree. The tree species with the most number of specimens were gingko, zelkova, cedar, black pine, cherry, red oak, and linden. Gingko, kaya, tabunoki, and linden, which are believed to be resistant to air pollution, remain in the central 23 districts of Metropolitan Tokyo, and geographical differences cannot be recognized clearly in their conditions. But no old red pine, fir, hemlock, cedar, or cryptomeria remain standing in the metropolitan districts. In outer Tokyo where environmental conditions are better, these tree specimens remain, but some show sign of damage. The zelkova trees; the most representative tree of the Kanto Plain, remains in Metropolitan Tokyo to some extent, but shows much damage in general, and if the pollution condition continues to worsen, it will not remain long. Other old trees may also gradually disappear.

31443 **APTIC NO. 53091**

Berge, Helmut

PLANTS AS INDICATORS OF AIR POLLUTION. *Toxicology (Netherlands), 1(1):79-89, March 1973. 34 refs.*

In that neither humans nor domesticated animals are reliable indicators, plants are becoming more and more important in the objective evaluation of a health environment. A large variety of annual and perennial plants can provide an opportunity to investigate, in a statistically satisfactory manner, the influence of air contamination on natural regions. However, biological indicator methods are not yet sufficiently developed to satisfy the needs of regional air quality control planning; there are too many climatic, topographical, edaphic, and biotic factors which may affect the reaction of the same indicator plant within different areas of the same region and during different seasons. It is also impossible to estimate precisely the future effects of new industry using only test plants. Nonetheless, in every region, distinct indicator plants should be sought which would best react under the prevailing circumstances to a change, and especially to a negative, emission situation. Test plants should be selected which are suitable for each particular emission situation, country, and district. Special preference should be given to evergreen perennial plants such as conifers and rhododendrons. (Author summary modified)

31444 **APTIC NO. 52829**

Carlson, C. E.

FLUORIDE POLLUTION IN MONTANA. *Fluoride, 6(3):127-137, July 1973. 6 refs.*

An intensive study of the effect of airborne fluorides on vegetation was undertaken in 1970 in the vicinity of an aluminum production plant in northwestern Montana. Fluorides greater than control levels (10 ppm) were found in vegetation over a region of 214,000 acres, and visual fluoride injury to conifers occurred in an area comprising 69,000 acres. Histological reactions characteristic of elevated fluoride levels occurred in conifer needle tissue, including hypertrophy of parenchymatous tissue. Forest insects were found to accumulate fluorides. Analyses of predaceous insects for fluoride indicated that fluorides are likely to be carried through the food chain. Even though the company reduced fluoride emissions by 67% between 1970 and 1971, data collected in 1971 indicated that vegetation in Glacier National Park, 7 air miles distant from the source, was still accumulating abnormal amounts of fluoride. (Author abstract)

31445 **APTIC NO. 53533**

Cathey, Henry M. and Howard E. Heggestad

EFFECTS OF GROWTH RETARDANTS AND FUMIGATIONS WITH OZONE AND SULFUR DIOXIDE ON GROWTH AND FLOWERING OF EUPHORBIA PULCHERRIMA WILLD. *J. Amer. Soc. Hort. Sci., 98(1):3-7, Jan. 1973. 18 refs.*

Eight cultivars of poinsettia, Euphorbia pulcherrima Willd., were evaluated for their sensitivity to alpha-cyclopropyl-alpha-(4-methoxyphenyl)-5-pyrimidine methanol (ancymidol), and for the degree of protection from ozone and sulfur dioxide injury afforded by applications of ancymidol and (2-chloroethyl) trimethyl ammonium chloride (chlormequat). Foliar sprays of ancymidol were at least 80 to 500 times and soil drench 1000 times more active than chlormequat in retarding stem elongation. The diameter of the bracts was reduced, but branching increased more on plants treated with ancymidol than on untreated plants. The cultivar Annette Hegg (AH) was more sensitive to ozone fumigations than Eckespoint C-1 (C-1). Sulfur dioxide also caused more injury to AH than to C-1. Ancymidol and chlormequat reduced visible injury induced by O3 and SO2. This increased tolerance to air pollution is believed to result from a series of morphological changes and reduced penetration of O3 and SO2 into the susceptible tissues. (Author summary modified)

31446 **APTIC NO. 52874**

Cowling, D. W., L. H. P. Jones, and D. R. Lockyer

INCREASED YIELD THROUGH CORRECTION OF SULPHUR DEFICIENCY IN RYEGRASS EXPOSED TO SULPHUR DIOXIDE. *Nature (London), 243(5407):479-480, June 22, 1973. 12 refs.*

The results of an investigation into the effects of prolonged exposure to sulfur dioxide on ryegrass (Lolium perenne) variety S23, when grown on a soil known to be unable to meet fully the plant requirement for sulfur are reported. The plants that were grown without added sulfate-S became deficient in S after the first added harvest. They were paler green than those grown with added sulfate-S and were finally distinctly chlorotic. The beneficial effects of SO2, as shown by increases in yield and S content of perennial ryegrass when grown with an inadequate supply of S to the roots, are in marked contrast with other investigations. It was also found that SO2 has a no significant effect on transpiration rate in ryegrass.

31447 **APTIC NO. 53025**

Dewey, Jerald E.

ACCUMULATION OF FLUORIDES BY INSECTS NEAR AN EMISSION SOURCE IN WESTERN MONTANA. *Environ. Entomol., 2(2):179-182, April 1973. 12 refs.*

Four major groups of insects such as pollinators, predators, foliage feeders, and cambial region feeders were collected near an aluminum reduction plant and analyzed for fluorides. Collections were made in June, August, and October in 1970 and in August 1971. From 58.0 to 585.0 ppm fluoride was found among the pollinators, from 6.1 to 170.0 ppm among the predators, from 21.3 to 255 ppm among the foliage feeders, and from 8.5 to 52.5 ppm among the cambial region feeders. Fluoride levels among the control insects sampled ranged from 3.5 to 16.5 ppm. The relative high fluoride levels in the 100% predatory insects indicate fluorides are either accumulated by respiration or are passed along the food chain. (Author abstract)

31448 **APTIC NO. 53503**

Freitag, R. and L. Hastings

KRAFT MILL FALLOUT AND GROUND BEETLE POPULATIONS. *Atmos. Environ., 7(5):587-588, 1973. 3 refs.*

The average rate of sulfate fallout as a function of distance from a kraft mill in Ontario, Canada, was calculated from data on accumulated SO4(--) concentrations in snow and rainwater samples. The rate of fallout generally decreased with increasing distance from the mill. Ground beetle populations in the area, sampled with pitfall traps, showed a marked increase in size with distance from the mill. These results imply that SO4(--) or some other particulate compound from kraft mill flue stacks is toxic to ground beetles.

31449 **APTIC NO. 52698**

Fujii, Shintaro

THE STATUS QUO OF PLANT DAMAGE BY AIR POLLUTION IN OKAYAMA PREFECTURE. *(Okayama-ken ni okeru taiki osen ni yoru shokubutsu higai no genjo). Text in Japanese. Shokubutsu Boeki (Plant Prot.), 27(6):249-252, 1973.*

Plant damage in Okayama Prefecture includes grape damage caused by fluorine from a firebrick manufacturing factory and vegetable and fruit tree damage due to oxidants such as ozone. By regulating hydrogen fluoride concentrations to less than 5 ppb/hr, grape damage was eliminated. Ozone damage (withering) has occurred on taro, Japanese leek, and Japanese radish. Experimental exposure of plants to 0.4-0.5 ppm for 1.5-6.0 hr, 0.25-0.3 ppm for 4-7 hr, and 0.25 ppm of O3 plus 0.1 ppm of sulfur dioxide for 2-2.5 hr caused deep green spots on taro, which developed into white or grey spots on the leaves. Japanese leeks had whitening of leaf tops when exposed to 0.5 ppm of O3 for 2 hr, 0.25-0.3 ppm for 5-6 hr, 0.1 ppm for 14 hr, and 0.25 ppm of O3 plus 0.1 ppm of SO2 for 4.5 hr. Recently other plants have suffered damage such as insufficient growth, lack of fruit, defoliation, and dropping of fruit, which suggest damage due to ethylene. Sulfur dioxide is suspected of causing tip-withering of mat grass in the southern part of Okayama Prefecture.

31450 **APTIC NO. 53161**

Gajan, Raymond J., John H. Gould, James O. Watts, and John A. Fiorino

COLLABORATIVE STUDY OF A METHOD FOR THE ATOMIC ABSORPTION SPECTROPHOTOMETRIC AND POLAROGRAPHIC DETERMINATION OF CADMIUM IN FOOD. *J. Assoc. Offic. Anal. Chemists, 56(4):876-881, 1973. 2 refs.*

A method for the determination of cadmium concentrations in food was studied. The method involves acid digestion, dithizone extraction, and determination by atomic absorption spectrophotometry and polarography. Ten laboratories participated in Phase I (spectrophotometry) of the study, with 15 participating in Phase II (polarographic). The 12 foods studied (lettuce, potatoes, orange juice, shredded wheat, milk, sugar, eggs, fish, frankfurters, rice, beans, and oysters) were spiked with concentrations of 0.05, 0.1, 0.2, 0.4, 0.5, 1.0, 1.5, and 2.0 ppm cadmium. Since only three laboratories submitted polarographic results, the data from Phase II of the study were not included in the final analysis. There were not statistically demonstrable differences for the atomic absorption method between spiking levels, foods, or laboratories. Coefficients of variation were acceptable. Most collaborators reported no difficulty with the method, although some had difficulty attaining the proper thymol blue end point during the neutralization of the acid digest. Strongly heating the solution will expel excess H2O2 and obviate this problem. It was recommended that the atomic absorption spectrophotometric method be adopted as official first action for the determination of cadmium in food; this recommendation has been adopted. (Author abstract modified)

31451 **APTIC NO. 52699**

Hampp, R., H. Ziegler, and I. Ziegler

THE EFFECT OF LEAD-IONS ON THE 14CO2-FIXATION AND ON THE ATP-SYNTHESIS BY SPINACH

CHLOROPLASTS. (Die Wirkung von Bleiionen auf die 14CO2-Fixierung und die ATP-Bildung von Spinatchloroplasten). Text in German. Biochem. Physiol. Pflanzen, 164(2):126-134, 1973. 12 refs.

Relatively little is known about the mechanism of lead effects on plants. The element lead is not known to have a function in the metabolism of plants and animals. With the increasing pollution of plants by automobile exhausts, knowledge of this gains importance. For this reason chloroplasts of spinach leaves were isolated. For fixation of carbon(14) dioxide the isolated chloroplasts were placed into a solution in a flask. The flask was in a water bath with a temperature of 20 C. After 3 min of preliminary illumination, carbonic acid ions and 0.1 ml of a lead nitrate solution were added. After 6 min of illumination, the reaction was stopped with 3 ml 80% methanol. The photosynthetic 14CO2 fixation by isolated spinach chloroplasts was inhibited by lead(++) non-competitively. The increase in inhibitory actions was most pronounced at 5-10 micromoles (Pb(++) concentrations. Even at high concentrations (200 micromoles Pb(++)), about 15% of the 14CO2 fixation capacity was left. The inhibitory action of Pb(++) was not reduced by calcium(++). Lead did not change the fixation pattern fundamentally; only the formation of sugar-diphosphates was more strongly reduced than that of the other compounds. The ATP formation in irradiated chloroplasts was drastically reduced; the increase of inhibitory action was most pronounced at concentrations up to 20 micromoles.

31452 **APTIC NO. 53100**

Hemphill, Delbert D., Carl J. Marienfeld, Ravula S. Reddy, Walter D. Heidlage, and James O. Pierce

TOXIC HEAVY METALS IN VEGETABLES AND FORAGE GRASSES IN MISSOURI S LEAD BELT. *J. Assoc. Offic. Anal. Chemists, 56(4):994-998, 1973. 12 refs. (Presented at the Association of Official Analytical Chemists, Annual Meeting, 86th, Washington, D. C., Oct. 9-12, 1972.)*

The effect of the lead mining operations in southeastern Missouri on the toxic heavy metal content of vegetable crops and forage grasses was studied. Lettuce, radishes, and greenbeans grown in seven counties in S.E. Missouri and three control counties in N. C. Missouri were analyzed for toxic metals. All samples were washed in distilled water. Atomic absorption analyses detected the following maximum levels of lead in the Southeastern samples (in micrograms/g dry weight): lettuce leaf, 1324; radish root, 518; and greenbean pods, 136. The cadmium levels in micrograms/g dry weight were: lettuce leaf, 34.5; radish root, 13.7; and greenbean pods, 8.5. Vegetables from the control counties contained markedly lower levels of these metals. Because considerable quantities of lead ore are transported from the mining area in S.E. Missouri to smelters in other areas, forage grasses (Festuca arundinacea and Tridens flavus) were collected along ore trucking and control routes. Maximum levels of lead (4350 micrograms/g dry weight, unwashed) and cadmium (4.32 micrograms/g dry weight) were detected in the grasses taken from the trucking routes. Considerably lower levels were detected in the grasses from the control routes. Although contamination of forage grasses in the mining area has been connected with the deaths of several horses, no positive correlations have yet been established between the toxic heavy metals concentrations in the vegetables from this region and human health parameters. (Author abstract modified)

31453 **APTIC NO. 52919**

Inoue, Takao

DAMAGE TO TREES BY SO2 GAS. *(Aryusan-gasu ni yoru jumoku no higai). Text in Japanese. Shokubutsu Boeki (Plant Prot.), 27(6):224-228, June 1973. 10 refs.*

Sulfur dioxide is the major pollutant which causes damage to green trees. Tree damage also occurs in industrial and residential areas where complicated pollution consisting of hydrogen fluoride, chlorine, nitrogen oxides, carbon monoxide, hydrocarbons, dusts, and oxidants occurs. The long-term effects of SO2 on plants was studied in Japan. Studies included effects of SO2, susceptibility of tree species, relationship between susceptibility and amount of sulfur accumulated, and experiments on actually planted trees. Specific susceptibility was noticeable in common trees such as cedar, Momi fir, red pine, cypress, and cherry trees. Damage was greater as the SO2 concentration increased. Damage to zelkova trees was conspicuous with discolored leaves and abnormal defoliation. Symptoms were related to growth stage, season, and soil moisture. The sulfur content of leaves damaged by SO2 was larger than that of healthy trees; the rate of sulfur accumulation was largest in red pines, Japanese cedars, and cypresses. Theories of the mechanism of damage are discussed. Damage was greater as the SO2 concentration increased in the air and in the leaves.

31454 **APTIC NO. 52905**

Kadota, Masaya

DAMAGE TO PLANTS BY OZONE. *(Ozone ni yoru shokubutsu no higai). Text in Japanese. Shokubutsu Boeki (Plant Prot.), 27(6):229-232, June 1973. 4 refs.*

Ozone can absorb ultraviolet radiation and thus protect plants. However, excessive ozone caused by smog can cause plant damage including defoliation, growth inhibition, decrease of fruit, chlorosis, necrosis, and spots. Leaves just prior to maturation are most susceptible to ozone. Species susceptibility to ozone is discussed. Ozone damage is smaller when the soil is dry and larger on leaves not receiving much sunshine. To determine ozone damage, it is convenient to determine the chlorophyll content in leaves; discoloration of leaves and palisade parenchymatous damage should be taken into consideration. When other pollutants coexist with ozone, it is difficult to confirm the origin of plant damage. Methods to lessen ozone damage include spraying of vitamin C, supplying sulfur to plants which demand large sulfur nutrition, and planting a strong plant species around a weak one.

31455 **APTIC NO. 52778**

Kanai, Ikuo

AN INVESTIGATION INTO THE ECOLOGICAL CONDITION FOR PINTAILS IN AND AROUND TOKYO. *(Tokyo-toka no onaga no seitai jokyo chosa). Text in Japanese. In: Study on Animals and Plants as Human Environmental Indices under Urban Environment. Japan Environmental Agency, p. 7-17, March 1973. 12 refs.*

The distribution proliferation and reproduction patterns of pintails (Cyanopica cyanus japonica), birds belonging to the crow family, were investigated, mainly by questionnaires and observations. The horizontal distribution, vertical distribution, limits of habitation, and historical transitions and migration patterns in the greater Tokyo area were investigated. In early 20th century, pintails did not inhabit the Tokyo area, but lived in eastern Saitama, northwestern Ibaraki, and central Chiba and Kanto plain. There is no definite record for their migration to Tokyo, but there is a record in 1934 of pintail nests observed in some areas of Tokyo. About 1955, pintails were seen in central parts of Tokyo Prefecture. Gradually, pintails began to move into the western and southwestern hills. This indicates that from about 1955 to 1960, the flora of the Musashino plain began to change and forced pintails to move westward deeper into the mountains. About 1965, pintails were observed in the deepest part of the basin of Hikawa. The migration of pintails westward reached the peak about 1965; probably, the factors pressing pintails movement increased drastically about that time. Twenty tree species have been observed with pintail nestlings, but it is difficult to determine the nest patterns of pintails from the tree specimens and topography.

31456 **APTIC NO. 52777**

Kawai, Shozo

A STUDY ON URBAN ENVIRONMENT AND THE GROWTH OF CONCHA VERMIN PARASITES. *(Toshi kankyo to kaigaramushi no hassei ni kansuru kenkyu). Text in Japanese. In: Study on Animals and Plants as Human Environmental Indices under Urban Environment. Japan Environmental Agency, p. 18-57, March 1973. 11 refs.*

About 400 specimens of concha vermins are recorded in Japan, and close to 200 are known in the Tokyo area. These insects suck sap of plants through long, thread-thin mouths and damage plants. Much of their life pattern is unknown, but it is known that concha vermins proliferate and thrive under deteriorated urban environmental conditions. In order to determine the suitability of concha vermin as an environmental index, its proliferation patterns were studied in the Tokyo area. Various species of plants and the types of concha vermins in various areas of the greater Tokyo were examined. The results are presented in tables and graphs. Air pollution and deterioration of soil increase the hatching of parasitic concha vermins. The decrease of mortality by a decrease of natural enemies also helps these insects to proliferate. Therefore, concha vermins can be used as one index for determining the degree of natural environmental destruction; however, the identification of species is difficult with these parasites. The distribution patterns within the same locality or the same trees are vastly different, and the degrees of proliferation seem to be different. However, one specimen is known to inhabit trees near highways; the close correlation between dusts and proliferation between tree shadiness and proliferation have been confirmed.

31457 **APTIC NO. 52790**

Lagerwerff, J. V., W. H. Armiger, and A. W. Specht

UPTAKE OF LEAD BY ALFALFA AND CORN FROM SOIL AND AIR. *Soil Sci., 115(6):455-460, June 1973. 12 refs.*

Growth and lead uptake by corn and alfalfa were measured in potted Chester silt loam at two soil pH levels (5.2 and 7.2) and with hydrogen chloride-extractable soil lead levels of 12, 64, 113, and 212 ppm. Most treatments were carried out in a greenhouse. In addition to aerial lead associated with nearby heavy traffic, fallout of particles of leaded paint constituted a contamination hazard. The control treatment of corn was also carried out at a nearby outside location, but in the absence of leaded-paint particulates. While the fallout of lead was three times heavier inside than outside, the aerosol lead concentration outside was almost twice as large as the one inside. The latter was reflected by the tassels only. All other plant parts, especially in the upper plant section, reflected the heavier lead fallout inside than outside. The plant parts in the lower plant section distinctly reflected increases in soil lead content. Rinsing the tops of alfalfa removed more lead from plants growing on unlimed soil than from those on limed soil. The amount of lead so removed from the tops increased as more lead was taken up from the soil, suggesting translocation of lead from the roots to the tops. (Author abstract)

31458 **APTIC NO. 53379**

Menlove, H. O.

DETERMINATION OF NACL CONTAMINATION IN PINE TREES BY NEUTRON ACTIVATION TECHNIQUES. *Los Alamos Scientific Lab., N. Mex. In: Environmental Monitoring in the Vicinity of the Los Alamos Scientific Laboratory. Calendar Year 1972, p. 52-53, March 1973.*

NTIS: LA-5184

Sodium chloride content in samples of ponderosa pine needles obtained from trees in the Los Alamos, New Mexico area was measured using neutron activation techniques in which the neutron radiations were obtained with a portable 252Cf (Californium) neutron source to determine if salt was responsible for the large number of brown and dead pine trees in the vicinity of roadways and drainage ditches in the area. All of the samples from the diseased trees contained at least 10 times as much sodium chloride as the control samples, and the average affected sample had 9120 ppm NaCl, which was 50 times greater than the average concentration in controls. Additionally, two samples were taken from opposite sides of the same large tree located near a road to establish further that the NaCl contamination originated with road salt. The sample from branches on the road side of the tree showed 11,900 ppm NaCl, whereas the sample from the opposite side of the tree had only 2400 ppm salt.

31459 **APTIC NO. 52834**

Mizuno, Akira and Hidehiko Midorikawa

STUDY ON THE EFFECTS OF AIR POLLUTION ON TREES AND THE GROWTH OF TREES. *(Taiki osen no jumoku ni oyobosu eikyo narabini ryokkaboku ikusei ni kansuru kenkyu). Text in Japanese. Aichi Prefecture (Japan), Forest Experiment Station, 70p., Jan. 1973.*

The effects of air pollutants, especially of sulfur oxides, on plants were investigated on the conditions of trees in forests, parks, and green areas in Nagoya, and experiments were given on newly planted trees in polluted and nonpolluted areas. Twenty locations in forests and 50 locations in parks and green areas within a 30 km radius from the Nagoya port, and black pines, cherry trees, gingko trees, linden, and garden phlox were examined. According to the measurements taken by the lead dioxide method, pollution spreads northward in summer by a southerly wind, and spreads in the opposite direction in winter. Gingko takes in a large amount of sulfur between spring and fall. The specimens from 70 locations showed that the S content in the leaves was greater in proportion to the closeness of the location to the center of pollution. A definite correlation was noted between the S content in leaves and the atmospheric content of sulfur trioxide, except in the case of garden phlox. The degree of growth damage of the newly planted pine trees and the S content in leaves had no relationship. The relationship between the S content in leaves and the tree damage was not clear; but in several areas, necrosis, chlorosis, and tip burn seemed to indicate the damage from air pollution, and the S content in these leaves were among the highest.

31460 **APTIC NO. 52773**

Nakamura, Katsuya

URBAN ENVIRONMENT AND PROLIFERATION OF TREE PERISPORIA. *(Toshi kankyo to niwaki no susubyo no hassei ni tsuite). Text in Japanese. In: Study on Animals and Plants as Human Environmental Indices under Urban Environment. Japan Environmental Agency, p. 89-100, March 1973. 7 refs.*

The tree disease that looks like black sooty mold is tree perisporia and is prevalent in the Tokyo area. This fungus is nourished by the sweet secretion of concha vermin and is spread by ants, houseflies, and wasps. Therefore there is a close correlation among concha vermin, ants, and perisporia fungi infestations. The prevalence of the disease and the types of concha vermins were investigated on several evergreen species in the 23 districts of metropolitan Tokyo and three unpolluted areas of western Tokyo. Parts of branches and leaves of diseased trees were put into polyvinyl bags, concha vermins on the back of the leaves were taken off, and the leaves were washed carefully. The water was filtered through filter paper which had been dried and weighed before the experiment. The filter paper was again dried and weighed to see the weight of the fungi. The fungi weight varied from 0.3 mg to 2.1 mg/sq cm. The amount of soot on undiseased leaves was 0.06 mg. It was discovered that in the metropolitan Tokyo area where the atmosphere is polluted, two species of concha vermin were the prevalent source for perisporia proliferation. In the three Tama areas west of Tokyo, another type of concha vermin was the nutritious source. Air pollution controls the natural enemies of concha vermin and promotes infestation of specific types of concha vermin. Therefore, certain types of perisporia, nourished by specific concha vermins can be used as an index for air pollution.

31461 APTIC NO. 52774

Nakamura, Katsuya

THE BLOOMING CONDITION OF FRAGRANT OLIVES IN TOKYO METROPOLIS AS AN INDEX FOR URBAN ENVIRONMENT. *(Toshi kankyo no seibutsu shihyo to shiteno Tokyo-to no mokusei no kaika gensho). Text in Japanese. In: Study on Animals and Plants as Human Environmental Indices under Urban Environment. Japan Environmental Agency, p. 81-88, March 1973. 13 refs.*

The degree of blooming of fragrant olives in Tokyo was investigated by a questionnaire sent out to schools, parks, temples, and shrines in 23 districts of metropolitan Tokyo. Responses were obtained from 299 schools, 17 parks, and 59 temples and shrines. The species, the general condition of blooming, the general condition of the tree such as length of branches and density of leaves, the size, descriptions of the environment, and maintenance conditions were questioned. As control areas, three locations in Tama county in western Tokyo were chosen. In metropolitan Tokyo, percentages of totally nonblooming trees by species were 25.5% for yellow flowers, 25% for white flowers, and 100% for cream colored flowers. In the Tama areas, only 1.7% of the yellow type did not bloom at all. The resistance of yellow fragrant olives to sulfur dioxide is considered rather strong according to past contact experiments; however, the effect of SO2 on the blooming condition is not known. Blooming of fragrant olives is very much affected by air pollution, lack of water, or deterioration of the soil, though it is not known which of these factors controls the flowering condition. It is known that SO2 deteriorates photosynthesis and decreases carbohydrates in trees. The reason for the fragrant olives in the Osaka area not blooming may be due to the deterioration of the tree metabolism of carbohydrate. Geographically, the distribution pattern of nonblooming trees coincides in the areas in Tokyo with more than 0.04 ppm SO2. However, the degree of blooming has improved considerably since 1972; whether this is due to the decrease of SO2 concentration in the atmosphere will require further investigation.

31462 APTIC NO. 53248

Nouchi, Isamu and Toshio Odaira

INFLUENCE OF OZONE ON PLANT PIGMENTS. *(Ozone no shokubutsu shikiso eno eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(2):120-125, Aug. 1973. 15 refs.*

Plants exposed to 20 ppm of ozone for 6 hr/day showed symptoms of damage including bleaching, chlorosis, and discoloration of leaves. The appearance of reddish-brown and reddish-purple pigment on the leaves of zelkova and morning glory leaves, respectively, was due to an anthocyanin pigment. The total chlorophyll content and the ratio of chlorophyll a to chlorophyll b decreased with the increased length of exposure to O3. Ozone accelerated the aging of the plants by decreasing the chlorophyll content and the a/b chlorophyll ratio.

31463 APTIC NO. 53489

Odaira, Toshio, Kogi Shiratori, and Tadoshi Sawada

ON A METHOD OF FIELD INVESTIGATION IN OXIDANT DAMAGE TO VEGETATION, PARTICULARLY TO THE CROPS. *(Nosakubutsu o chushin to shita okishidanto shokubutsu higai no yagai chosa hoho ni tsuite). Text in Japanese. Taiki Osen Nyusu (Air Pollution News), 76(5):1-6, May 1973.*

To obtain more accurate information, field investigations must be designed to eliminate the possible differences caused by the individual investigator, plants, or environmental conditions. It is desirable to conduct an investigation during a short period of time since the symptoms of plant damage vary with time. A method was proposed for investigating damage to spinaches, scallions, taros, morning glories, radishes, chinese cabbages, and Santo vegetables at 67 locations in Tokyo, Chiba, Saitama, and Kanagawa. The degree of damage was classified into 0%, 1%, and 2% which indicated no injury, 10% and 20% injuries. The investigations were to be carried out twice a year in June and August, 48 hours after the occurrence of photochemical oxidants. The recording methods were by investigation cards and photographs.

31464 APTIC NO. 52775

Okutomi, Kiyoshi and Seiji Tsuji

ANALYSIS OF REGIONAL NATURE PRESERVATION BY VEGETATION. *(Shokusei shizendo ni yoru chiiki shizensei no kaiseki). Text in Japanese. In: Study on Animals and Plants as Human Environmental Indices under Urban Environment. Japan Environmental Agency, p. 73-80, March 1973. 6 refs.*

The tree growth and natural vegetation in five areas of Tokyo (including very small parts of Saitama and Yamanashi Prefectures) were investigated to see the conditions in these areas which were Mt. Kumotori in farthest west Tokyo, Mt. Ontake in western Tokyo, Tama hills in central Tokyo, Kokubunji in central Tokyo, and the Suginami District in Metropolitan Tokyo. The type of growth, tree species, areas covered by vegetation, density, and soil percolation were investigated. Classifications were given by the degree of vegetation and by the degree of natural preservation, and the ratio of each class to the total area space. Maps were prepared showing natural growth, planted growth, residental areas with greenery, residential areas without greenery, factories, and rice fields. It was clear that the degree of natural preservation and vegetation declined in the order of Mt. Kumotori, Mt. Ontake, Tama Hills, Kokubunji, and Suginami District, from west to east, or from the farthest to the closest to metropolitan Tokyo.

31465 APTIC NO. 52737

Puth, Gerlinde and U. Luettge

THE EFFECT OF SULFITE ON MEMBRANE PERMEABILITY IN PLANT CELLS: SO3(--) INHIBITION OF THE BETACYANIN EFFLUX FROM RED BEET TISSUE INDUCED BY N-BUTANOL. *(Sulfitwirkung auf die Membranpermeabilitaet von Pflanzenzellen: SO3(--)-Hemmung des n-Butanol induzierten Betacyaninefflux aus dem Gewebe roter Rueben). Text in German. Biochem. Physiol. Pflanzen, 164(2):195-198, 1973. 9 refs.*

A suggestion that the industrial pollutant sulfur dioxide and the related anion sulfite non-specifically effect plant membranes independent of a mere acid effect was tested using betacyanin efflux from red beet tissue as an indicator for membrane leakiness. Red beet was cut into 1 mm slices and washed 24 to 48 hours in aerated 0.1 mM calcium sulfate solution. The solution was repeatedly renewed until all red coloring was gone. The slices were then used for measurement of the betacyanin efflux. One such slice was placed into 0.1 mM phosphate buffer pH 7.2 plus n-butanol and sodium sulfite plus sodium sulfate so that the sodium ion concentration and the concentrations of SO3 and SO4 ions together were constant. Following the efflux tests (2.5 to 12.5 min) the beta-cyanine concentration of the solution was colorimetrically determined at 546nm. Sulfite did not induce excess permeability. However, SO3(--) appears to seal membrane leaks caused by n-butanol, cince SO3(--) drastically reduces n-butanol induced betacyanin efflux.

31466 ***APTIC NO. 52835***

Taniguchi, Masahiro

TESTS ON THE PROTECTION OF TREES FROM POLLUTION. (Jumoku no kogai keigen taisaku shigen). Text in Japanese. Tokushima-ken Ringyo Shikenjo Hokokusho (Tokushima Prefect. For. Exp. Sta., Annu. Rep.), 1973:50-53, March 1973. 2 refs.

Experiments were conducted to see the effects of chemicals as tree protectors against air pollution by sulfur dioxide and other toxic gases. Potted seedlings and trees around factories were sprayed with chemicals to form films on the leaves in order to reduce absorption of toxic gases. The protective chemicals were 10% Micron, 5% OED Green, and 0.5% Menedale. The trees were sprayed with these chemicals five days prior to an exposure to 10 ppm of SO2 for 3 hr. One-year old leaves were taken from each tree before and after the treatment and the sulfur, nitrogen, phosphoric acid, and potassium contents were analyzed. As for oak trees, untreated trees and those treated by Menedale showed signs of damage, but those treated by Micron and OED Green were free of damage. Spindle trees and pine trees were damaged in all cases, but those treated by Micron and OED Green were less damaged than untreated trees. Menedale showed no effect for protection against SO2. Analyses of leaves showed those treated by OED Green had the least S content, and OED Green was believed to be most effective in forming protective films over the leaves. However, further experiments will be conducted to find other more effective chemicals against pollutants.

31467 **APTIC NO. 52728**

Wylie, P. B. and L. C. Bell

THE EFFECT OF AUTOMOBILE EMISSIONS ON THE LEAD CONTENT OF SOILS AND PLANTS IN THE BRISBANE AREA. *Search, 4(5):161-162, May 1973. 16 refs.*

Considerable accumulations of lead were found in soils and plants adjacent to highways of moderate traffic density (3700-16,000 vehicles/day) leading from Brisbane. At 2 m, soil lead contents of 10-120 micrograms/g above background levels (18-24 micrograms/g) were measured by atomic absorption spectrophotometry. Plants (Rhodes grass) contained up to 64 micrograms/g lead. While these levels do not pose an immediate threat to plants, animals, or human health, the continuing build-up of lead in the environment cannot be ignored. As traffic densities on many roads in Brisbane approach 50,000 vehicles/day, a more detailed survey of lead accumulation in the city is being undertaken.

31468 **APTIC NO. 52928**

Yamazoe, Fumio

THE AIR-POLLUTANTS WHICH CAUSE PLANT DAMAGE. *(Shokubutsu higai no genin to naru taiki osen busshitsu). Text in Japanese. Shokubutsu Boeki (Plant Prot.), 27(6):220-223, June 1973. 5 refs.*

Ozone and peroxyacetyl nitrate and its homologues cause oxidative damage to plants. Sulfur dioxide, formaldehyde, hydrogen sulfide, and carbon monoxide cause reductive damage. Hydrogen fluoride, silicon tetrafluoride, hydrogen chloride, sulfur trioxide, sulfuric acid mist, and hydrocyanic acid cause acidic attacks. Ammonia causes alkaline attacks. Ethylene, propylene, soots, smokes, dusts, metal, metals oxides, and other particulates also cause plant damage. Pollutants are classified according to order of toxicity as follows: strongly toxic substances causing symptoms as the ppb level such as fluorine, chlorine, and PAN; moderately toxic substances causing symptoms at ppm levels such as sulfur oxides and nitrogen oxides; and fairly toxic substances which cause symptoms at levels between tens and thousands of ppm such as aldehydes, HCl, NH3, HCN, H2S, and CO. Recently, damage due to the synergistic action of two pollutants has been increasing (such as SO2-HF, SO2-PAN, and SO2-O3). Origin, toxicity, and damage mechanism of major pollutants are discussed.

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31469 **APTIC NO. 52650**

Frey, John E.

THE EFFECTS OF OZONE ON THE SYNTHESIS AND STORAGE OF NUTRIENTS IN SOYBEAN SEEDS. *Northern Colorado Univ., Greeley, Biology Dept., Thesis (D.A.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 110p. 63 refs.*

Soybean plants were subjected to daily ozone fumigations of 25, 50, and 75 pphm throughout their life cycles to determine the effect of O3 on the vegetative biomass, seed yield, and lipid, phospholipid, fatty acid, crude fiber, amino acid, and protein contents of the seeds. The vegetative biomass of the plants grown in a 75 pphm O3 environment was reduced 53.8% as compared to that of the control. Fumigation with 50 pphm reduced the biomass by 22.3%. The reduction in seed yield in the 75 and 50 pphm O3 environments was 77.8 and 54.6%, respectively. The seeds produced in the 75 pphm O3 environment showed a 5.18% decrease in lipids and a 40.1% increase in free amino acids. In the 50 pphm O3 environment, the lipid decrease was 3.78% and the amino acid increase was 20.6%. Ozone fumigation had no effect on the protein and crude fiber contents of the seeds. (Author abstract modified)

31470 **APTIC NO. 52964**

Gruender, H.-D.

STUDIES ON THE EFFECT OF FLUORINE EMISSION ON CATTLE. *(Untersuchungen ueber die Fluorimmissionswirkungen auf Rinder). Text in German. Deut. Tieraerztl. Wochschr., 79(7):147-150, 1972. 3 refs.*

Studies on the effects of fluorine emissions on cattle in the nearby of industrial plants emitting fluorine compounds are reviewed. Dental fluorosis, bone fluorosis with such manifestations of exostosis or hyperostosis, reduction of the elasticity of the bones with increased susceptibility to fracture, and reduction of the food uptake are among the principal consequences of daily fluorine intakes exceeding the normal value by 5 to 10 times. The effect of administering aluminum salt mixtures with the feed or drinking water to lower fluoride resorption was studied. Damage due to fluorine in cattle can be reduced by special management and feeding techniques.

31471 **APTIC NO. 52524**

Herath, H. M. W. and D. P. Ormrod

TEMPERATURE AND SULFUR NUTRITION EFFECTS ON CO2 COMPENSATION VALUES IN BARLEY, PEAS, AND RAPE. *Plant Physiol., 49(3):443-444, 1972. 13 refs.*

The purpose of this study is to determine whether the sulfur nutritional status of the plant affects its carbon dioxide compensation values, and if such effects are temperature dependent. Plants of barley, rape and peas were investigated. Highly significant differences in CO2 compensation values were obtained between temperature regimes. There are significant interactions between temperatures and S level in both the CO2 compensation values and the S content of leaves, indicating that S uptake as well as the effect of S on CO2 compensation values were both dependent on temperature. The results showed clearly that sulfur nutrition status will affect the CO2 compensation values of high compensation plants, and that the magnitude of the effect could be modified by the temperature at which the plants are grown.

31472 *APTIC NO. 53104*

Maienthal, E. June

ANALYSIS OF BOTANICAL STANDARD REFERENCE MATERIALS BY CATHODE RAY POLAROGRAPHY. J. Assoc. Offic. Anal. Chemists, vol. 55:1109-1113, Sept. 1972. 16 refs.

The need for certified botanical and biological standards both in research and in industrial and field applications is leading to the development and production of a number of new Standard Reference Materials by the National Bureau of Standards. The first of these to be produced and certified was an orchard leaf standard. The determination of a number of important trace elements by cathode ray polarography was investigated and found to offer considerable advantages in sensitive and accuracy over many other techniques. In addition, several elements may be determined simultaneously in the same solution. The methods were developed and applied to the analysis and certification of nickel, lead, bismuth, and iron in the orchard leaves. Results were also obtained for aluminum, which has not yet been certified. Nickel was determined on 1 g samples after extraction with dimethylglyoxime and methyl chloride. Lead and bismuth were determined concurrently on 1 g samples after a sodium diethyldithiocarbamate separation. Iron and aluminum were determined on 0.25 g samples after cupferron separations. These methods and the new standard reference material, which has now been certified for 18 elements, should be useful in analytical problems concerned with trace metals in foods, plants, and other environmental samples. (Author abstract modified)

31473 APTIC NO. 53000

Masek, Vaclav

EFFECT OF COKE PLANT FLUE DUST ON PLANT BIOLOGICAL PROCESSES. *(Der Einfluss des Flugstaubes aus der Kokerei auf einige biologische Prozesse der Pflanzen). Text in German. Gesundh. Ingr., 93(3):77-80, 1972. 17 refs.*

The effect of three different types of cokery flue dust from coal preparation, batteries, and coke classing, on growth and other biological processes in bean plants were studied. The cokery dusts contained 13.14-15.12% ash, 4.16-22.05% volatile substances, 6-168 micrograms soot/g, 2-98 micrograms 3,4-benzopyrene/g, and had pH values of 6.48 to 7.30. The respective percentages of the fractions below 5 micron, 5-10 micron, and 10-50 micron were 1.4-6.6%, 6.5-32.5%, and 16.1-58.1%, respectively. The specific surface ranged from 0.84 to 6.80 sq m/g. Coke dust strewn on young bean plants at a rate of 1 g/sq cm considerably reduced the photosynthetic activity as determined from the dry matter content, and the chlorophyll level. The dust samples did not release significant amounts of nutrients when suspended in water. The dust had no noticeable influence on the rate of growth of the plants and of the rate of increase of the dry substance when the plants were grown in dust suspension. However, stimulation of the root growth was observed. Addition of 1 g of dust to 100 g of soil markedly diminished the availability of soil water to the plants. Judged from the results of starch hydrolysis by means of amylase, and of albumin hydrolysis by means of pepsin, the dust had little effect on enzyme reactions.

31474 APTIC NO. 52993

McMurchie, E. J., W. B. McGlasson, and I. L. Eaks

TREATMENT OF FRUIT WITH PROPYLENE GIVES INFORMATION ABOUT THE BIOGENESIS OF ETHYLENE. *Nature (London), 237(5352):235-236, May 1972. 18 refs.*

The influence of exogenous ethylene on the concomitant endogenous production of the gas in climacteric (e.g., bananas, which undergo a large increase in respiration accompanied by marked changes in composition and texture) and nonclimacteric (e.g., citrus fruits, which show no changes in respiration associated with changes in the composition of the fruit) fruits was studied. Green bananas, light green lemons, and mature oranges were ventilated with streams of ethylene free humidified air to which propylene was added at 500 ppm. In the bananas, this treatment resulted in a typical climacteric pattern of respiration, with a rise in respiratory rate and production and a decrease in respiratory quotient (RQ). An increase in endogenous ethylene production was detected more than 3-hr after the beginning of the rise in respiratory rate; in untreated bananas, the increase in endogenous ethylene production preceded the rise in respiration by about 18 hr. The effects of propylene treatment were not seen in the lemons and oranges. Two systems regulating ethylene biogenesis in the banana are proposed: a system characterized by the initiation of ethylene biogenesis; and a second system in which ethylene triggers the respiratory climacteric. When propylene or ethylene is added to bananas, ethylene production by the first system is circumvented and production by the second system is initiated, producing the delay in the rise and peak of endogenous ethylene production relative to respiration. Lemons and oranges apparently lack system 2. These results support the hypothesis that the critical difference between climacteric and nonclimacteric fruits rests in their relative abilities to produce ethylene in response to low concentrations of this gas.

31475 APTIC NO. 52705

Robak, Hakon

PROBLEMS AND TASKS OF DIAGNOSIS OF FOREST INJURIES CAUSED BY AIR POLLUTION. *(Probleme und Aufgaben der Diagnostik der durch Luftverunreinigung verursachten Waldschaeden). Text in German. Preprint, International Union Forest Research Organization, 10p., 1972. (Presented at the International Union Forest Research Organization Congress, Sopron, Hungary, Oct. 9-14, 1972.)*

The tasks of diagnosing injuries from air pollution involve the determination of whether the observed injury does indeed stem from air pollution and which emission component caused the injury. The problems of diagnosis are manifold due to the different reactions of the plants to the various pollutants or to the absence of reactions. A brief review of direct and indirect effects of air pollutants is given. In cases of very mixed pollution coming from many different sources, the decisive factors can be determined only through greenhouse exposure experiments. Leaf and needle analyses are valuable tools for diagnosis. Anatomic criteria, growth retardation, and harvest losses are not specific enough. Aerial photography also lacks specificity. Doubts still exist concerning the specific sensitivity of indicator plants. Some experts place the Medicago sativa plant among the sulfur dioxide indicator plants claiming that this plant is rather resistant to fluorine, while others group it with the fluorine indicator plants on the grounds that this plant reacts to very small concentrations of fluorine with minor but visible injuries. Widespread agreement seems to exist that lilies are particularly sensitive for fluorine, papilionacae for SO2. Lichens and mosses are obviously indicators of the general air pollution. The problem of injuries by indirect emissions which may spread over thousands of kilometers is discussed. For instance, sulfuric acid formed through oxidation of SO2 and subsequent water intake renders strongly acid precipitation which particularly affects soils with a weak buffering capacity, and eventually all vegetation growing in such soils.

31476 APTIC NO. 53376

Trautwein, K., Chl. Kopp, and R. Buchner

FLUOROSIS AND ENVIRONMENTAL HYGIENE. *(Fluorose und Umwelthygiene). Text in German. Tieraerztl. Umsch., 27(1):7-8, 10-12, 14-16, 1972. 54 refs.*

A review of fluorosis in animals, as reported in veterinary medical journals, is presented. Although ubiquitous in nature in micro-quantities, fluorine is present in considerable amounts in the vicinity of aluminum foundries and other industrial plants which are responsible for its emission. The fluorine is taken up by plants and transmitted to animals in their fodder or in their drinking water. It has been established (in Germany) that the ingestion by animals of more than 1.0 mg of fluoride/kg body weight/day could result in fluorosis, with more than 1.5 mg, fluorosis is sure to occur. In chronic fluorine poisoning the most marked clinical symptoms are changes in the teeth and bones and characteristic lameness. The chronic absorption of slight quantities of hydrofluoric acid from the air constitutes the greatest threat to plants; the danger of fluoride uptake through plant roots from the soil is less likely. The effect of the poison in all organisms is enhanced by external factors such as humidity and temperature of the air. With more effective supervision to avoid the introduction of fluorine into plants and into the air, and with proper supervision of animal fodder, it is possible to prevent toxic effects.

31477 **APTIC NO. 52651**

Wheeler, Garland Laurin

THE EFFECTS OF FLUORINE ON THE CYCLING OF CALCIUM, MAGNESIUM, AND POTASSIUM IN PINE PLANTATIONS OF EASTERN NORTH CAROLINA. *North Carolina State Univ., Raleigh, Dept. of Botany, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 72p. 66 refs.*

The effect of fluorine emissions from ore processing plants in pine ecosystems, with respect to the points of accumulation and the effects on the cycling rates of calcium, magnesium, and potassium, was investigated in North Carolina pine plantations. The only visible damage occurred during the late winter and early spring and was characterized by a visible browning or necrosis of needles. Fluorine was associated with an increase in the return rate of Ca and K through leaf leaching and of all three nutrients, Ca, K, and Mg, by increasing the amount of litterfall The Ca content of the litterfall increased with increasing F content. There was no detectable relationship between F or the three nutrients and net primary production. The sites of accumulation of F were in the needles, litter, and soil. The trees accumulated the greatest amount of Ca, followed by K and Mg in that order. (Author summary modified)

1971

31478 **APTIC NO. 52994**

Carlson, Clinton E.

MONITORING FLUORIDE POLLUTION IN FLATHEAD NATIONAL FOREST AND GLACIER NATIONAL PARK. *Forest Service, Missoula, Mont., Forest Insect and Disease Branch, 27p., 1971 (?). 4 refs. (The same information described in this paper also appears in Carlson, Clinton E. and Jerald E. Dewey Environmental Pollution By Fluorides, Forest Service, Missoula, Mont., Forest Insect and Disease Branch 62p., Oct. 1971. 27 refs.)*

Measurements of fluoride pollution made in 1971 in Flathead National Forest and Glacier National Park, caused by fluoride emissions from the Anaconda Aluminum Company at Columbia Falls, Montana, are presented and compared with a similar study completed in 1970. Chemical analysis of vegetation indicated average fluoride concentration from 4% less, in Glacier National Park, to 77% less, close to the aluminum plant, when compared to 1970 data. Injury indexes dropped an average 45.8%. The total polluted area was 59 sq mi (34,560 acres) less than in 1970, and injury was found on 84 sq mi (53,920 acres) less than in 1970. Analysis of insect tissue indicated insects are still accumulating excessive fluorides. Above-normal fluorides are still accumulating in vegetation up to 12 miles from the Glacier National Park.

31479 **APTIC NO. 53375**

Gentile, A. G., W. A. Feder, R. E. Young, and Z. Santner

SUSCEPTIBILITY OF LYCOPERSICON SSP. TO OZONE INJURY. *J. Am. Soc. Hort. Sci., 96(1):94-96, 1971. 7 refs.*

Accessions, breeding lines, and varieties of Lycopersicon spp. (tomatoes) and one accession of Solanum pennelli Correll (tomato) were evaulated for sensitivity to controlled concentrations of ozone and to ambient air at Waltham, Ma. The plant material were exposed in different stages of development to controlled ozone concentrations of 0.25 ppm for 3 hr, 0.05 ppm for 2 wk, and to 0.10 ppm for 4 wk. Based upon the degree of foliar injury, the tested material was separated into tolerant, intermediate, and sensitive populations. The highest degree of tolerance was observed in L. esculentum Mill. and the highest degree of sensitivity in L. pimpinellifolium. Germination of pollen from inflorescences exposed to 0.10 ppm was reduced 40% in sensitive accessions of L. pimpinellifolium when placed on artificial medium. No significant reduction was observed in the most tolerant accession of L. esculentum. Differences in percent germination were not observed when pollen of sensitive and tolerant accessions was placed on artificial medium and exposed to 0.10 ppm ozone for a 6-hour period. Reciprocal cross pollinations between exposed and unexposed populations led to normal fruit development with viable seeds. (Author abstract)

31480 **APTIC NO. 53007**

Ward, F. Prescott

A SUMMARY OF ECOLOGICAL INVESTIGATIONS AT EDGEWOOD ARSENAL, MARYLAND: FISCAL YEAR 1970. *Dept. of the Army, Edgewood Arsenal, Md., Medical Research Lab., Task 1B662710AD6302, EASP 100-101, ACT-1905, 87p., June 1971. 23 refs.*

The results of research conducted in fiscal year 1970 concerning the environmental impact of the open-air testing of chemical warfare agents at Edgewood Arsenal, Maryland are reported. Included are a brief history of chemical agent research, development, production, and testing at the Arsenal, and a description of the formation of the Ad Hoc Advisory Committee for Review of Testing Safety at Edgewood Arsenal, Maryland, and Fort McClellan, Alabama The recommendations of this committee are given, along with the program planning for their implementation. Progress toward the implementation of other committee recommendations concerning the transportation of agents, the weights and heights at which agents can be disseminated, and keeping the public and scientific community informed of the results of the test program and safety practices follow. The study area is then described both physically and ecologically, with a comprehensive review of agent traials within this area being included. The final sections of the report contain summary reports of current investigations in the ecology program. These investigations include cholinesterase measurements on three sentry species and species of commercial and aesthetic value, the use of mechanical and biological monitors in conjunction with lethal agent tests, toxicity studies using estuarine species and plants, and basic ecological studies of terrestrial and estuarine species. The aims of continuing research using computers, surveys, and censuses are also summarized. The locations of Carroll Island land and water monitor stations are appended. Toxic agents tested included herbicides, talc, smoke, phosphorus, and toxic agents for war and riot control.

1970

31481 **APTIC NO. 52574**

Bohne, H.

FLUORIDES AND SULFUR DIOXIDES AS CAUSES OF PLANT DAMAGE. *Fluoride, 3(3):137-142, July 1970. 8 refs.*

Fluoride and sulfur trioxide levels were determined in three polluted industrial areas where the two pollutants had damaged vegetation. The appearance of the leaves was typical of fluoride injury with no indication of toxicity by sulfur dioxide. Chemical analyses of fluoride and SOx contents of the injured plants supported these findings. Fluoride levels in gladioli ranged within 3.4-8.7 mg% whereas SO3 levels ranged within 0.77-1.15%, thus showing that the greatest damage from combustion products was caused by fluoride compounds, primarily hydrogen fluoride. (Author summary modified)

31482 **APTIC NO. 52635**

Reinert, R. A., A. S. Heagle, J. R. Miller, and W. R. Geckeler

FIELD STUDIES OF AIR POLLUTION INJURY TO VEGETATION IN CINCINNATI, OHIO. *Plant Disease Reptr., 54(1):8-11, Jan. 1970. 10 refs.*

The plant injury attributed to air pollution in Cincinnati and air quality with respect to ozone, nitrogen dioxide, and sulfur dioxide were correlated based on data collected in a field study. Plant damage was investigated for petunia, bean, radish, squash, tomato, alfalfa, oats, and tobacco plants, grown in unfiltered air chambers and compared with control groups grown in charcoal-filtered-air chambers. The symptoms included tissue damage and early senescence and were characterized by flecking, chlorosis, necrosis, stippling, bleaching, and mottling. Acute injury was related to high ozone levels, and the symptoms were usually similar to those resulting from experimental exposure to ozone. (Author abstract modified)

31483 **APTIC NO. 53109**

Reisch, K. W. and G. E. Hull

THE ROLE OF TREES IN THE ENVIRONMENT. *Ohio Rep., vol. 55:72-73, 1970.*

Trees serve as positive factors in the reduction of air pollution. They serve as filters in that, as polluted air passes around their leaves, it is diluted by the oxygenated air. Solid pollutants in the air are adsorbed on the surfaces of leaves and stems and are washed to the ground during rainfall. Solids are also precipitated from the air as turbulence is reduced when air passes under and through the trees. Trees are also detrimentally affected by pollutants and the unnatural environment often found in urban and suburban situations. Because of the increased emphasis on the ornamental planting of trees in cities and on streets and highways, the adaptability of various species to specific conditions is under study. The Ohio Agricultural Research and Development Center has undertaken a two-phase study to determine the suitability of various species for various landscapes and to determine their ability to thrive under various conditions.

31484 **APTIC NO. 53356**

Ruhling, Ake and Germund Tyler

SORPTION AND RETENTION OF HEAVY METALS IN THE WOODLAND MOSS HYLOCOMIUM SPLENDENS (HEDW.) BR ET SCH. *Oikos, 21(1):92-97, 1970. 6 refs.*

The capacity of Hylocomium splendens to absorb heavy metal ions from dilute solutions was investigated. The sorption and retention generally followed the order: copper or lead greater than nickel greater than cobalt greater than zinc or manganese. This order proved valid within a wide range of concentrations and independently whether the ions were supplied in pure or mixed solutions. The capacity of the moss tissues to sorb traces of Cu and Pb in the presence of comparatively large amounts of calcium, potassium, magnesium, and sodium was very great. This makes it probable that these ions, supplied with the precipitation, are almost quantitatively sorbed by the moss carpets. A large share of Ni when present in precipitation, will also possibly be sorbed. A natural carpet of Hylocomium splendens showed a continuous uptake of manganese, iron, and Ca from young to old tissues, whereas the increase in the concentrations of minor heavy metals was balanced by the dry matter decrease through decomposition. The developing and mature layer below the moss carpet had no enriched heavy metals above the concentrations of the old moss tissues. (Author abstract)

31485 **APTIC NO. 53105**

Schofield, Edmund and Wayne L. Hamilton

PROBABLE DAMAGE TO TUNDRA BIOTA THROUGH SULPHUR DIOXIDE DESTRUCTION OF LICHENS. *Biol. Conserv., 2(4):278-280, July 1970. 32 refs. (Presented at the Alaska Science Conference, 20th, College, Alaska, Aug. 25, 1969.)*

Lichens, particularly the fruticose members of the genus Cladonia, are important components of many arctic ecosystems and form a principle component of the forage of indigenous caribou. The Nanamiut Eskimos, in turn, depend on the caribou for food, clothing, and other necessities. The lichens, particularly the caribou forage lichens, are extremely sensitive to sulfur dioxide. Atmospheric pollution from recent oilfield development in Arctic North America therefore seems likely to eliminate lichens from large areas. This threat is intensified by the climatic conditions on the Arctic Slope which make air pollution more serious there than in most other places. Probable future oilfield development in Greenland and the Soviet Union indicates that sulfur dioxide pollution will become an increasingly serious threat to remaining arctic ecosystems. Uncontrolled burning of crude oil, fuel oil, and natural gas should be avoided and adequate sulfur extraction facilities should be installed to protect these ecosystems. (Author abstract modified)

1969

31486 **APTIC NO. 53362**

Brennan, Eileen, Ida A. Leone, and P. M. Halisky

RESPONSE OF FORAGE LEGUMES TO OZONE FUMIGATIONS. *Phytopathology, vol. 59:1458-1459, Oct. 1969. 5 refs.*

Foliar injury was observed in Pennscott red clover (Trifolium pratense) coincident with elevated concentrations of ozone in the ambient air. To verify that ozone was the phytotoxic agent, 10 varieties of forage legume were exposed for 4-hour intervals to five ozone concentrations ranging from 0.10 to 0.30 ppm. At 0.10 ppm ozone failed to produce any visible foliar injury in any forage legume. As the ozone concentration was increased to 0.15 ppm and higher, red clover, white sweet clover, and Ladino clover were increasingly injured. Alsike clover and alfalfa were only slightly damaged with increasing ozone concentration, whereas crown vetch was uninjured even at the 0.30 ppm ozone. At the lower ozone concentrations, on the day following fumigation, water soaked areas appeared on the leaves, which progressed to the necrotic state within the next two days, depending on the amount of sunshine. At the higher concentrations, water soaking was observed on the more sensitive varieties by the end of the fumigation. The high ozone sensitivity of red clover was confirmed. (Author abstract modified)

31487 **APTIC NO. 53358**

Costonis, A. C. and W. A. Sinclair

OZONE INJURY TO PINUS STROBUS. *J. Air Pollution Control Assoc., 19(11):867-872, Nov. 1969. 17 refs.*

In a study of the ozone induced needle blight of eastern white pine in central New York, acute injuries naturally induced on field trees during a year of relatively low ozone concentrations (1966) were compared with injuries induced during a year of higher concentrations (1967). Injuries were more frequent and severe and were associated with higher mean ozone concentrations in 1967 than in 1966. Characteristic symptoms were induced on foliage of pine branches exposed to controlled doses of ozone as low as 7 + or 1 pphm for 4 hr or 3 + or - 1 pphm for 48 hr. Such doses were equalled or exceeded two and four times, respectively, in the field during the 1967 season. Ozone sensitivity of pine needle tissue was increased by fumigation in atmospheres containing water mist. High concentrations of ozone (40-60 pphm) caused general injury of foliage of both ozone susceptible and resistant trees; the symptoms were unlike those found in the field or caused by fumigation with low concentrations of ozone. (Author abstract)

31488 **APTIC NO. 53374**

Sinclair, W. A.

POLLUTED AIR: POTENT NEW SELECTIVE FORCE IN FORESTS. *J. Forestry, vol. 67:305-309, May 1969. 33 refs. (Presented at the Society of American Foresters, Annual Meeting, Philadelphia, Pa., Oct. 2, 1968.)*

A review of some of the known acute and chronic effects of gaseous air pollutants on forest trees, with particular reference to ozone damage to pines, leads to perception of polluted air as a new selective force in temporate zone forests. This force is amplified by known interactions of air pollutants (as predisposing agents) with tree pests such as bark beetles, and by probable interactions with facultatively parasitic root and stem fungi, with insect defoliators, and with environmental factors such as drought. Heritable interspecific and intraspecific variations in susceptibility to injury by polluted air and by specific pollutants are exploitable characteristics of trees, allowing selection of resistant trees and development of pollutant sensitive trees as perennial bioindicators of air pollution. Experimental studies of the magnitude of air pollutant impact on growth and reproduction of important tree species, of types of acute and chronic injury caused by various combinations of air pollutants, and of the impact of interactions of air pollutants with other agents are recommended. (Author abstract)

1968

31489 **APTIC NO. 53357**

Brennan, Eileen and Ida A. Leone

THE RESPONSE OF PLANTS TO SULFUR DIOXIDE OR OZONE-POLLUTED AIR SUPPLIED AT VARYING FLOW RATES. *Phytopathology, vol. 58:1661- 1664, Dec. 1968. 9 refs.*

The response of tomato and cucumber plants to identical concentrations of either sulfur dioxide or ozone that was circulated over the plants at two different flow rates in paired fumigation chambers was investigated. At 0.40 ppm SO2, tomato plants were not injured in 4 hr regardless of the rate of flow. At 0.50 ppm SO2, necrosis occurred at both rates, but was more severe at the high rate of flow. At 0.65 ppm SO2 plant injury was severe at both flow rates. Exposure for 3 days at 0.30 ppm resulted in plant injury only at the high flow rate. Plants fumigated with SO2 at the high flow rate tended to accumulate a greater total and soluble sulfur content than those exposed to the same concentration at the low flow rate. In the cucumber, the high flow rate at 0.18 ppm ozone concentration caused an upper surface bleaching of both the primary and secondary leaves, whereas the low rate injured only the primary leaves. At the increased concentration of 0.22 ppm ozone, the low flow rate caused damage to both aged leaves, but the high rate caused even more extensive damage. The results of exposure of the cucumber to SO2 were similar to those of the tomato plant. Similar results were also obtained from naturally occurring pollutants when ambient air was circulated over tobacco and petunia plants at the two flow rates.

31490 **APTIC NO. 53396**

Sloover, Jacques De and Fabius LeBlanc

MAPPING OF ATMOSPHERIC POLLUTION ON THE BASIS OF LICHEN SENSITIVITY. *Proc. Symp. Recent Adv. Trop. Ecol., 1968, p. 42-56. 41 refs.*

A method of expressing air pollution degrees, as reflected by the epiphytic vegetation, by means of a simple cartographic document is presented which allows one to visualize qualitatively and at a glance the average condition of air pollution and its effects on epiphytes over a long range of time. The stations should be numerous and as far as possible uniformly distributed over the entire territory to be investigated. Great care should be taken in locating only homologous stations to avoid unjustified comparisons and to minimize the influence of factors other than pollution. The following parameters must be taken into account to acquire a precise picture of the influence of polluted air on corticolous vegetation: total number of species, cover degree of each species, frequency of each species per investigated unit, height reached by each species above ground level, vitality, and fertility. Indices of atmospheric purity (I.A.P.) from all stations studied are plotted on a map; and stations having, within a certain range, the same I.A.P. values are linked together. The isopleths will bring out numerous figures representing isotoxic zones.

1967

31491 **APTIC NO. 53423**

Linzon, S. N.

OZONE DAMAGE AND SEMIMATURE-TISSUE NEEDLE BLIGHT OF EASTERN WHITE PINE. *Can. J. Botany, vol. 45:2047-2061, 1967. 25 refs.*

Investigations were conducted in forests remote from large urban areas to determine whether there was any cause and effect relationship between naturally occurring atmospheric ozone and semimature-tissue needle blight (SNB) of eastern white pine (Pinus strobus). The daily average concentration of atmospheric ozone, relative to cracking by rubber test strips, was determined for three seasons, and no apparent relationship was found between excessive rubber cracking and the occurrence of outbreaks of SNB on susceptible white pines. The repeated application of vitamin C, a reducing agent, to newly developing needles of susceptible white pints, did not prevent the appearance of the symptoms of SNB or retard subsequent symptom development. In fumigation experiments with artificially produced ozone, concentrations of over 0.60 ppm as measured by the manual potassium iodide method, or 0.40 ppm by the coulometric method, were required to produce severe markings on the new needles of the white pine under study. Foliage on material derived from trees nonsusceptible to SNB was more responsive to these high concentrations of ozone and exhibited more uniform damage than foliage derived from trees susceptible to SNB. The macroscopic and microscopic symptoms of damage caused by excess ozone was dissimilar from the typical symptoms of SNB. The results of these investigations indicate that naturally occurring atmospheric ozone in stands of eastern white pine is not an incitant of SNB. (Author abstract)

1966

31492 **APTIC NO. 53355**

Engle, R. L. and W. H. Gabelman

THE EFFECTS OF LOW LEVELS OF OZONE ON PINTO BEANS, PHASEOLUS VULGARIS L. *J. Am. Soc. Hort. Sci., vol. 91:304-309, 1966. 15 refs.*

The effects of low levels of ozone on Pinto beans were investigated. Fourteen day old Pinto beans (Phaseolus vulgaris L.) were fumigated continuously from 1 to 5 days with .05 ppm ozone. The unifoliate leaves after 3 days of fumigation exhibited premature senescence. This effect was not increased by longer fumigation. Lateral buds in the axils of the unifoliate leaves were stimulated to elongate, whereas the leaves were reduced in size and weight. Avena colcoptile straight growth tests were made to test the possible relation of the presence of auxin like material to the premature leaf senescence and bud elongation. Although definite auxin like activity was observed, the data did not suggest a mechanism for premature senescence of the unifoliate leaves or the elongation of buds.

1963

31493 **APTIC NO. 53110**

Gorham, Eville and Alan G. Gordon

SOME EFFECTS OF SMELTER POLLUTION UPON AQUATIC VEGETATION NEAR SUDBURY, ONTARIO. *Can. J. Botany, vol. 41:371-378, 1963. 4 refs.*

A floristic survey of 29 lakes and ponds near Sudbury, Ontario was undertaken to examine the effect of smelter pollution upon aquatic vegetation. The numbers of submerged and floating macrophyte species present in the ponds and lakes were inversely related to the concentrations of dissolved sulfates, which rose sharply within about 4 to 5 miles of the smelters. Although pollution often leads to strong acidification, the numbers of species were low even where the sulfuric acid was almost totally neutralized and the water was above pH 6. Because sulfate ions are unlikely to be toxic at the levels encountered, and since pollution also increases the concentration of heavy metals in the water, it is suggested that the water may reach toxic levels near the smelters. Leptodictyum riparium and Eleocharis acicularis v. submersa seem to be the most tolerant species with regard to smelter pollution, while Utricularia vulgaris and Potamogeton epihydrus v. nuttallii appear to be rather sensitive to it. (Author abstract modified)

31494 **APTIC NO. 53361**

Kershaw, Kenneth A.

LICHENS. *Endeavour, vol. 22:65-69, 1963. 15 refs.*

The extreme susceptibility of lichens to air pollution is emphasized in a discussion of the distribution and ecology of the two symbionts. The susceptibility is possible due to the indiscriminate and rapid absorption of solutes over the surface of the thallus. Lichens are virtually absent from towns and industrial areas. In an investigation in Kvarntorp, Sweden, the distribution of lichens corresponded markedly with the levels of air pollution, mainly by sulfur dioxide and secondly to the low humidity of the area. There are a few lichens that are tolerant of pollution and occur abundantly in industrial and suburban areas. Lecanora conizaeoides and Stereocaulton pileatum are prevalent in large cities of Great Britain and are early colonizers of trees and brickwork. The apparent preference of lichens for asbestos roofing in polluted areas is related to the high water absorbing power of the substratum and the high base content, with the consequent power of neutralizing acidic atmospheric pollutants. The flora growing on an asbestos tiled roof eight miles from London was examined and revealed four species: S. muralis, L. dispersa, R. demissa and C. vitellina. The density of the S. muralis was approximately 1/sq m with diameters up to 6 cm. The density of the other species was extremely high, up to 368 apothecia/sq cm for L. dispersa. The figures suggest that the high water absorbing properties and basicity of the asbestos are the factors responsible for the prolific lichen growth.

31495 **APTIC NO. 53433**

Menser, H. A., H. E. Heggestad, O. E. Street, and R. N. Jeffrey

RESPONSE OF PLANTS TO AIR POLLUTANTS. I. EFFECTS OF OZONE ON TOBACCO PLANTS PRECONDITIONED BY LIGHT AND TEMPERATURE. *Plant Physiol., vol. 38:605-609, 1963. 10 refs.*

An investigation was conducted to study the interrelation of environmental preconditioning and the response of four tobacco (Nicotiana tabacum L.) varieties to ozone. Light and temperature caused significant effects on the response of 8-week-old tobacco plants exposed to ozone in a filtered-air fumigation chamber. Two-hour fumigations at 0.20 to 0.25 ppm showed: a 22-hour extended photperiod caused nearly complete ozone protection; and severe injury occurred when plants were kept in the dark for 42 or 66 hours before exposure to ozone. Observations of stomatal activity indicated that light and dark preconditioning caused no injury-correlated patterns of stomatal behavior. Other 2-hour fumigations revealed a 5 deg difference during the 2-week cultural period before fumigation resulted in significantly less injury to plants grown at the lower temperatures; and an overnight temperature of 5 deg resulted in less damage than when plants were kept at 25 deg during the same period. (Author summary)

1961

31496 **APTIC NO. 53107**

Brodo, Irwin M.

TRANSPLANT EXPERIMENTS WITH CORTICOLOUS LICHENS USING A NEW TECHNIQUE. *Ecology, 42(4):838-841, Autumn 1961. 10 refs.*

A technique for transplanting corticolous lichens by lichen bearing bark discs has been developed to aid in the study of lichen ecology. The transplant procedure involves removing a lichen with its substrate as a bark disk and transplanting it intact; the death of the inner bark tissues of the disk presumably has little effect on the attached lichens. Transplant experiments involving the transfer of lichen bearing disks from one height to another were designed to study the factors influencing the specific vertical distribution of corticolous cryptograms on trees. The most important factors appear to be microclimatic, with moisture probably being the single most important factor. A similar experiment was set up to examine the effects of the New York City environment on the east-west distribution of lichens. New York City had a strong detrimental effect on lichen growth and survival. Moisture relations and atmospheric pollution have been suggested as possible explanations for this effect. Since the effects of transplanting appear quickly and can easily be seen and analyzed, lichens may be noteworthy as natural indicators of air pollution.

1956

31497 **APTIC NO. 53022**

Glater, Ruth Ann Bobrov

SMOG DAMAGE TO FERNS IN THE LOS ANGELES AREA. *Phytopathology, 46(56):696-698, Dec. 1956. 7 refs.*

A new symptom was observed in ferns in response to the polluted air of Los Angeles. In the field, as well as under lath, fern leaves showed characteristic markings following a period of high smog intensity. These symptoms were quite distinct from those previously reported on other plants. Damage manifested itself as a tan spotting of leaves, followed by local or general dehydration of the affected areas, ending in necrosis of the entire leaf. The typical fern leaf or frond is large, pinnately compound, and often dissected. The cells are large and many armed, forming a network around a tremendous amount of internal air space. Stomata are limited to the lower leaf surface. About 24 hours following the incidence of smog, tan lesions, commonly near the smaller veins, appear on the leaves. The general response of the cells of fern leaves to smog is discussed.

31498 **APTIC NO. 53370**

Wander, I. W. and J. J. McBride, Jr.

CHLOROSIS PRODUCED BY FLUORINE ON CITRUS IN FLORIDA. *Science, vol. 123:933-934, May 25, 1956. 6 refs.*

A unique chlorotic leaf pattern on citrus trees in Florida that is attributed to florine is reported. The chlorosis was first noted in Polk County in April 1950 and was associated with a triple superphosphate manufacturing plant that recently opened. The polluting condition was corrected, but as new triple superphosphate plants opened, chlorosis increased. Florida pebble rock phosphate contains 2-4% fluorine which is released during the production in triple superphosphate. Chlorotic leaves from affected groves ranged in fluorine content from 370 ppm to as low as 48 ppm. Chlorotic citrus leaves were observed uo to 6 miles away from the nearest plant, but the leaves were not abnormally high in fluorine content. It appears that fluorine causes leaf chlorosis and is then dissipated by translocation. Normal appearing leaves away from the affected area contained from 12 to 30 ppm fluorine. In 1955 sprays of aqueous acids were applied at concentrations 0.1N to 4 year old Ruby Red grapefruit trees located 20 miles from the nearest triple superphosphate plant. Seven sprays of 1 l of solution each were applied during a 2-month period, and an identical chlorotic leaf pattern emerged in the trees sprayed with hydrofluoric and fluosilicic acid. Citrus trees in California that contained up to 211 ppm fluorine did not develop chlorosis and may be the results of differences in climatic conditions, primarily the higher humidity in Florida.

1933

31499 **APTIC NO. 53363**

Zimmerman, P. W., William Crocker, and A. E. Hitchcock

THE EFFECT OF CARBON MONOXIDE ON PLANTS. *Contrib. Boyce Thompson Inst., vol. 5:195-211, 1933. 7 refs.*

The effects of carbon monoxide on root formation and growth were investigated in 108 species of plants. Most of the plants were exposed to 1% CO under bell jars or in Wardian cases. Forty-five species showed epinastic growth of leaves. Several species showed hyponasty which caused upward curling of leaves. Stem elongation of most species was retarded, varying with the concentration of the gas. New leaves produced while the plants were in carbon monoxide were normal in shape, but were abnormally small. Injury was evidenced by abnormal yellowing of the leaves, beginning with the oldest. Abscission of leaves was usually associated with yellowing, though in a few cases, abscission of young leaves occurred without yellowing. Carbon monoxide gas caused hypertrophied tissues on stems and roots of most species. During recovery an abnormally large number of side shoots arose from latent buds of many species. Motion pictures of Mimosa pudica showed that carbon monoxide gas caused the leaves to lose their correlation and change their normal equilibrium position to gravity. They lost their sensitiveness to contact or heat stimuli but the leaves moved about more rapidly than those of controls. Plants exposed for only 24 hr were not badly injured and recovered to approximately normal conditions within a day. Since carbon monoxide causes growth rigor and loss of sensitiveness to external stimuli, it is considered as an anesthetic. This conclusion is supported by the fact that animals which do not have hemoglobin are readily anesthetized by an 80% carbon monoxide air mixture of the gas. (Author abstract modified)

EFFECTS-MATERIALS

1973

31500 **APTIC NO. 52848**

Tokyo Metropolitan Environmental Protection Research Inst. (Japan)

STUDIES ON METAL CORROSION DUE TO AIR POLLUTION. *(Taiki osen ni yoru kinzoku fushoku no kenkyu). Text in Japanese. 172p., March 1973.*

Corrosion of various metals including carbon steel, stainless steel, copper, zinc, and aluminum was studied in various atmospheres, including the Joto Health Center, Fumato elementary school, Kasuya health center, Tokyo tower, Tokyo Metropolitan Environmental Protection Research Inst. (highly polluted area), Tokyo Metropolitan Public Health Research Lab. (mildly polluted area), and Takao Natural Science Museum (clean area). Air pollutants and weather conditions were measured for five years from April 1970. Electrical conductivity of dust fall, pH of dust fall, metal in dust fall, corrosion degree, the relationship between the corrosion degree and type of steel, X-ray and infrared analysis of exposed carbon steel, the relationship between humidity and rust, components of rust, and the relationship between weather conditions and corrosion of steel, aluminum, copper, and zinc were studied.

31501 **APTIC NO. 52917**

Gunma Prefectural Industrial Lab. (Japan)

STUDY ON METAL CORROSION BY LOW-CONCENTRATION GAS (4TH REPORT). *(Teinodo gasu ni yoru kinzoku fushoku kenkyu (Dai 4-po)). Text in Japanese. Gunma-ken Kogyo Shikenjo Nyusu (Gunma Prefect. Ind. Lab. News), no. 12:3, Jan. 1973.*

The substances formed on copper alloy (brass), steel, and aluminum plates by corrosion are discussed. Plates exposed at a highly polluted industrial area had more corrosion than those exposed at a less polluted industrial area and at a control area. Brass samples had changes in chlorine and sulfur content. Hydrogen chloride and sulfur dioxide are probably the pollutants which caused this. Meteorological conditions in the three areas were the same. Hydrogen chloride probably played a major role in causing corrosion of the brass. No correlation, however, was established between corrosion and air pollution.

31502 **APTIC NO. 53220**

Claverie, P. and Y. Porcheron

POLLUTION OF INSULATORS. THE PHENOMENA INVOLVED IN THE POLLUTION OF INSULATORS AND PROTECTION OF ELECTRIC INSTALLATIONS IN POLLUTED REGION. *(La pollution des isolateurs. Les phenomenes de pollution des isolateurs et l isolement des ouvrages en regions polluees). Text in French. Rev. Gen. Elec., 82(3):166- 183, March 1973. 13 refs.*

Insulators of electric lines on seashores, in the vicinity of metallurgical plants, chemical plants, or power plants are convered with slightly conductive, highly hygroscopic, dust. Under humid conditions, dissolution of salts contained in this dust forms a layer of electrolyte. Analysis of the flashover mechanism of insulators exposed to atmospheric pollution has demonstrated that flashover voltage and leakage current are completely governed by a characteristic function of the pollutant layer which represents a resistence in series with an electric arc at each point of the insulator surface covered with a layer of dust. This function can be determined experimentally by measuring the leakage current. Naturally formed pollution layers can be under certain conditions reproduced artificially on insulators by a saline fog. The severity of pollution at a given site can be characterized by referring to comparable saline pollution. The pollution severity will then be expressed by the same number as the pulverized saline concentration, for example in g sodium chloride/l. A proposal is made to classify polluted sites into four classes with insulators of corresponding dimensions assigned to each class. Leakage current interpretation can be used to advantage to determine the safety coefficient of polluted insulators.

31503 **APTIC NO. 52948**

Franz, E.-D.

CRYSTALLINE AND AMORPHOUS PRIMARY PRODUCTS DURING THE RUSTING OF METALLIC IRON IN SO2 CONTAINING ATMOSPHERES AT DIFFERENT MOISTURE CONTENTS. *(Kristalline und amorphe Primaerbildungen beim Rosten von metallischem Eisen in SO2-haltiger Atmosphaere bei verschiedenen*

Feuchtigkeitsgraden). Text in German. Werkstoffe Korrosion, 24(7):598-601, 1973. 14 refs.

The phase shifts and chemical reactions on iron sheets exposed to sulfur dioxide-polluted industrial air prior to the formation of iron sulfate were studied. An oxide-free sheet iron plate (37.5/5 cm) was placed into a glass bottle of 1-liter volume. Air was passed into the glass and SO2 gas for a short period so that the SO2 concentration was higher than in urban atmosphere. This speeds up the reaction process which in normally polluted air would take years. The dependence of the sulfate formation and of the rusting process on the relative humidity was regulated by replacing a 1-centimeter high water level at the bottom of the glass by 10%, 20%, and concentrated sulfuric acid. The interaction between the SO2 and the moisture film on the metal may give rise to the successive formation of the following products: sulfurous acid, ferrous sulfite, ferrous fulfate, and ferrous sulfide; further interactions are possible between these reaction products, so that ferric sulfate, iron disulfide, and iron thiosulfate may be found. Characteristic differences are found, depending from the moisture content of the atmosphere (saturated and down to 77%). At 77% relative humidity the reactions come to a standstill at the FeS stage, while at 50% relative humidity no reaction can be observed.

31504 **APTIC NO. 53298**

Oelsner, G.

CORROSION TESTING FEATURES. *(Probleme der Korrosionspruefung). Text in German. Galvanotechnik, 64(6):460-469, June 15, 1973.*

The problems arising in laboratory testing of corrosion are reviewed; the poor correspondence between results of such tests is attributed to the multiplicity of factors which can cause corrosion. Corrosion of metals in industrial areas is subject to sulfur dioxide content of the air, to other pollutant gases, humidity, dusts, and emissions from chemical plants. Even if the laboratory can duplicate all these conditions, the time element involved would be impractical to duplicate in the laboratory. Basically, all corrosion testing is confined to one of the following: immersion tests, spray tests, and tests in which the reaction between the metallic surface and corrosive medium takes place in the gaseous phase, including the humidity of the ambient air. Immersion tests may be either under conditions of intermittent or continuous immersion. Aeration, motion, and changes in the solvent play an important role in these tests; the effect of aeration on corrosion of steel is shown graphically. Spray testing is almost exclusively confined to the use of solvents containing chlorides, occasionally with addition of acetic acid or copper salts. In the case of testing in the gaseous phase, a certain amount of moisture must be added continuously in order to reproduce the natural conditions of corrosion. The most reliable results are obtained when conditions in the laboratory may be created which most resemble the atmosphere of the factory where the objects to be tested are manufactured. In addition to moisture, sulfur dioxide and dust particles must be added to the ambient air immediately in contact with the sample to be tested. Evaluation of the results must take into account the rate of corrosion and the degree of surface roughness. The loss of weight caused by corrosion is to be considered, as well as possible pitting.

1972

31505 **APTIC NO. 52818**

Shimosato, Shoichi

EFFECTS OF GASEOUS AIR POLLUTANTS ON CONTACT MATERIALS. *Electron. Commun. Japan, 55-C(9):98-105, Sept. 1972. 16 refs.*

The effects of gaseous air pollutants such as sulfur dioxide, nitrogen dioxide, hydrochloric acid, and chlorine on electrical contacts are reported. Contacts of silver, gold, platinum, and palladium were exposed to synthetic gases in static and dynamic conditions. After exposure the surface film was examined by contact-resistance measurement, electron diffraction, X-ray diffraction, and constant-current electrolysis. The results showed that Ag is most affected by the pollutants and Au is least affected. Sulfur dioxide and HCl have relatively small effects, Cl2 affects all materials greatly except Pt; and NO2 has an intermediate effect. (Author summary modified)

1971

31506 **APTIC NO. 52915**

Gunma Prefectural Industrial Lab. (Japan)

STUDY ON METAL CORROSION BY LOW-CONCENTRATION GAS (2ND REPORT). *(Teinodo gasu ni yoru kinzoku fushoku kenkyu (Dai 2-ho)). Text in Japanese. Gunma-ken Kogyo Shikenjo Nyusu (Gunma Prefect. Ind. Lab. News), no. 7:3, Sept. 1971. 2 refs.*

Corrosion of steel, copper alloy (brass), and aluminum was studied for 1, 2, 3, 7, 9, and 10 months. Three pieces of each sample were exposed at three locations. The degree of corrosion was rated by naked eye and microscopic examination. The quantity of light was also measured by a luster meter. The rust formation on steel plate samples decreased after 2 months. Steel samples exposed in the industrial zone had lower ratings (more corrosion) and less reflected light than those at an exposure location near the Gunma Prefectural Industrial Laboratory. Samples were more corroded at the most polluted site.

31507 **APTIC NO. 52916**

Gunma Prefectural Industrial Lab. (Japan)

STUDY ON METAL CORROSION BY LOW-CONCENTRATION GAS (3RD REPORT). *(Teinodo gasu ni yoru kinzoku fushoku kenkyu (Dai 3-po)). Text in Japanese. Gunma-ken Kogyo Shikenjo Nyusu (Gunma Prefect. Ind. Lab. News), no. 8:3-4, Dec. 1971. 2 refs.*

The corrosion of metals was studied during 10- and 12-month exposure tests. Gravimetric analyses were made of the sample pieces. Samples included steel, aluminum, and brass. After removing rust, the sample was weighed and compared to the original weight. Weight decrease due to corrosion was greater at more polluted industrial locations.

31508 **APTIC NO. 52914**

Gunma Prefectural Industrial Lab. (Japan)

STUDY ON METAL CORROSION BY LOW-CONCENTRATION GAS (1ST REPORT). *(Teinod gasu ni yoru kinzoku fushoku kenkyu (Dai 1-po)). Text in Japanese. Gunma-ken Kogyo Shikenjo Nyusu (Gunma Prefect. Ind. Lab. News), no. 5:3, March 1971.*

The rusting, aging, and corrosion of various metals, materials, and surface coatings in Gunma Prefecture due to air pollution were studied at three locations. Cold rolled steel plate, stainless steel plate, aluminum alloy plate, copper alloy plate (brass), coated steel plate (with lacquer), and coated steel plate (with oil paint) were tested for corrosion by external appearance, luster, weight change, and rusting. Observations were made 1, 2, 3, 6, 9, and 12 months later. Results are not given.

1969

31509 **APTIC NO. 53420**

Matsushima, J. and T. Ueno

ATMOSPHERIC RUST ON STEEL II - BEHAVIOUR OF GASEOUS SULPHUROUS ACID IN THE ATMOSPHERE AND SULPHUR IN STEEL. *Boshoku Gijutsu (Corrosion Engineering, Tokyo), 18(2):65-73, 1969.*

22 refs. Translated from Japanese. British Iron and Steel Industry Translation Service, London (England), BISI 8032, 24p., April 1973.

The behavior of sulfur dioxide on low alloy weathering steel and high strength steel (SM 50) was clarified as to the rate of sulfate formation in the rust and its removal by water treatment. The rate of sulfate formation can be obtained by exposing steels rusted by pre-exposure in an industrial atmosphere for various periods up to two years to a radioactive SO2 environment for a few days and by determining the radioactivity of the formed sulfate. The rate of dissolution of the radioactive sulfate is determined either by immersion in distilled water or by spraying tap water on to the surface. The results show that the rate of sulfate formation is lower on weathering steels and on steels pre-exposed to the atmosphere for longer periods. The tendency is in parallel with the variation of the corrosion rates in the atmosphere with respect to steel composition and exposure time. The amount of dissolved sulfate is less for weathering steels, but the percentage is almost the same regardless of steel composition. The reaction of sulfur contained in steel was also studied. In the absence of copper, sulfur changes to sulfate and accumulates in the rust in the course of atmospheric corrosion, but the presence of copper drastically reduces the sulfate formation. The material balance of sulfate in rust films i considered and a mechanism of corrosion resistance of weathering steels in connection with the behavior of sulfate is discussed. (Author abstract)

EFFECTS-ECONOMIC

1973

31510 **APTIC NO. 53415**

Rochelle, Gary T.

ECONOMICS OF FLUE GAS DESULFURIZATION. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., 30p., May 1973. 11 refs. (Presented at the Environmental Protection Agency, Flue Gas Desulfurization Symposium, New Orleans, La., May 14-17, 1973.)*

The costs of flue gas desulfurization for fossil fuel boiler plants were analyzed. Flue gas desulfurization can be applied to 75% of the existing fossil fuel utility capacity in the United States at an annualized cost of 1.5 to 3.0 mills/kwh, which represents a savings over the cost of substitute low sulfur fuels. Regenerable processes are generally less costly than throwaway processes at waste disposal costs above $3/ton of wet sludge. Newer processes such as citrate and double alkali may be up to 20% less costly than currently available processes such as Wellman-Lord and limestone scrubbing. The anualized costs for a given process can easily vary from 2 to 6 mills/kwh with typical variations in plant size and load factors. Flue gas desulfurization can be significantly cheaper to use with medium sulfur coals if only a portion of the flue gas needs to be treated in order to meet emission standards. Extrapolation of this costing technique to industrial boiler conditions indicates annualized costs of 60 to 130 cents/MMBTU with throwaway processes. This cost data base consistently predicts actual first-of-a-kind project capital costs within 10 to 20%. (Author summary modified)

31511 **APTIC NO. 53389**

Gittinger, L. B.

SULPHUR - OUTLOOK FOR PRODUCERS BEST IN SEVERAL YEARS. *Eng. Mining J., 174(4):152-155, March 1973.*

The outlook for sulfur producers appears better than it has in several years projected on the basis of continued growth in demand for traditional uses, particularly for the world s phosphate industry; development of new uses; and the opening of new markets such as the USSR and the People s Republic of China. These new markets may take the form of sulfur, fertilizers, and other sulfur-consuming products or agricultural commodities. The major unknown on the supply side is the potential for recovery of sulfur in commercial forms from air pollution sources, particularly from stack emissions at coal or oil-burning utility plants. Recovery of sulfur from the production of low-sulfur fuel oils and from the reduction of sulfur dioxide emissions from copper and other metal smelters will continue to expand under the pressure of air anti-pollution regulations, although in some cases the sulfur will not be recovered in a commercial form. Control systems for utility stack emissions are still in the pilot plant stage, and recovery of sulfur from utilities in commercial quantities appears unlikely during the current decade. Free World production of sulfur in all forms during 1972 amounted to 31 750,000 long tons sulfur equivalent, whereas consumption accounted for 30,100,000 long tons.

31512 **APTIC NO. 52759**

Nagoi, Junichi

CONTROL OF AIR POLLUTION AND HOW MUCH ITS COSTS - EXAMPLES OF CALCULATIONS FOR JAPAN IN 1985 - (SEQUEL). *Chem. Economy Eng. Rev., 5(6):30-36, June 1973.*

A linear programming model was developed to prevent air pollution caused by oil products and to design an oil product supply system that will minimize distribution costs. Calculation results provide optimal inputs of fuel resources (e.g., crude oil, heavy fuel oil, liquefied natural gas, nuclear energy), economic evaluations of these input resources as sources of low-or zero-sulfur energy, optimal supply pattern of oil products (quantities of oil passed through refining units), optimal capacities of desulfurization units and economic evaluations of these units, optimized distribution costs of oil products, and estimated increases in the prices of oil products resulting from desulfurization. The following steps can be taken to meet future stringent sulfur restrictions: mix light fractions with fuel as much as possible; carry out flue gas desulfurization; and use a combination of vacuum gas oil desulfurization and gasification. In 1985, antipollution investment costs will be $1242 million to reduce sulfur emissions to 2 million tons or $2057 million to reduce emissions to 1 million tons. Costs/ton of sulfur removed will be $178 if emissions are reduced to 2 million tons, $253 at 1.20 million tons, $259 at 1 million tons, and $320 at 0.7 million tons.

31513 **APTIC NO. 52765**

Schneider, Alan M.

AN EFFLUENT FEE SCHEDULE FOR AIR POLLUTANTS BASED ON PINDEX. *J. Air Pollution Control Assoc., 23(6):486-489, June 1973. 9 refs.*

The pindex method of weighing air pollution emissions according to their toxicity is used to develop a table of effluent fees for the five major pollutants. The fees are worked out in detail using California as an example. The fees in dollars per pound of pollutant are as follows: sulfur dioxide 0.10, particulate matter 0.177, carbon monoxide 0.0034, nitrogen dioxide 0.107, and hydrocarbons 0.0319. All fees other than that for hydrocarbons would be the same in any geographic region where there was an excess of hydrocarbons over NO2 with respect to photosynthesis of oxidants. If this fee were applied to all pollution sources in California, a total of about 797 million dollars would be collected annually. A table of damage effects is also presented, which can be used to perform cost effectiveness analyses of proposed control tactics.

31514 **APTIC NO. 53031**

Schwartz, S. I.

BENEFITS AND COSTS OF AUTOMOBILE INSPECTION-MAINTENANCE PROGRAMS. *Chemosphere, 2(3):101-106, May 1973. 6 refs.*

The benefits and costs of inspection-maintenance programs for automobiles are discussed. A model is described for predicting future exhaust emission reductions of an inspection-maintenance program. The administrative and political feasibility of such programs are also described. The inspection-maintenance program is given a generally negative assessment. The effectiveness of reducing photochemical pollution will be quite low in 1975 and even smaller in 1980. The effectiveness in reducing carbon monoxide emissions is likely to be higher, with a reduction of 12-20% in 1975. Direct costs will be high and distributed inequitably, with potentially serious economic and social consequences falling on the poor. The most attractive feature of the inspection-maintenance program is its high political feasibility -- a dubious reason for its adoption. Other alternatives should be considered, such as disconnecting the vacuum advance, which is cheaper and more effective than inspection-maintenance. However, if decision-makers choose to implement inspection-maintenance programs, they should take measures to eliminate or reduce the excessive impacts on the poor. (Author conclusions modified)

31515 APTIC NO. 53108

Tarquin, Anthony J., Jack A. Dowdy, and Howard G. Applegate

COST OF AIR POLLUTION CONTROLS IN THE POWER INDUSTRY. *Pub. Util. Fortn., 91(7):40-44, March 29, 1973. 8 refs.*

The fixed cost of air pollution controls in the power industry to the average power customer was determined. The information was obtained via correspondence with 183 power companies throughout the United States. Attempts were made to correlate particulate removal efficiency with total cost. Difficulties were encountered due to the inconsistent methods of segregating the reporting costs, but the average fixed cost of air pollution controls in the power industry was determined on a unit basis. The average residential power customer pays about $2.24/yr for the investment cost of particulate air pollution control devices; this is about $0.000351/kw/hr. There is a need to establish a standard method for determining the cost of controlling air pollution. A knowledge of the unit costs of each of the various methods of air pollution abatement would simplify minimizing the overall costs for obtaining given emission levels. The cost of retrofitting an air pollution control device in an existing power plant usually costs at least twice as much as installing a similar device in a new plant. (Author abstract modified)

31516 APTIC NO. 52750

Willeke, Rainer

ECONOMIC FOUNATIONS FOR ENVIRONMENTAL PROTECTION POLICY. EVERYTHING HAS ITS PRICE. *(Oekonomische Grundlagen der Umweltschutzpolitik. Alles hat seinen Preis). Text in German. Umwelt (Duesseldorf), 3(4):42-46, 1973.*

A source which emit pollutants to the air causes costs which the operator of the source has not included in his cost calculations, namely social costs. These are the costs that persons harmed by the emissions have to carry in the form of doctor bills. As an instrument for correcting the false cost calculation, a so-called polluting tax is being discussed. It is difficult, however, to assess the social costs of air pollution. In most cases direct determination is impossible. This is particularly true when assessing the effects of automobile exhausts on man. The only feasible method is that of indirect cost estimation. It is based on the introduction of preventive measures whose costs can be determined. Preventive measures carried out for a long period of time will eventually lead to a reduction of social costs. As soon as the costs of preventive measures as well as the reduction of social costs assume a more or less steady course, the approximate social costs can be determined.

1972

31517 APTIC NO. 53385

Clark, Robert M.

AN INVESTMENT DECISION MODEL FOR CONTROL TECHNOLOGY. *Environmental Protection Agency, Cincinnati, Ohio, National Environmental Research Center EPA-R5-72-004, 24p., Sept. 1972. 5 refs.*

NTIS: PB 213482

A mathematical model of investment decisions in control technology for environmental management, incorporating borrowing and lending variables, has been structured to provide an efficient method of studying the problem. The model formulation assumes that investment decisions for control technology can be separated into a total operating and capital cost decision and an investment cost decision. These cost are minimized in two stages. The first stage utilizes a fixed-charge algorithm and the second stage utilizes a linear programming algorithm. A problem is solved utilizing the construction, operation, and financing of an incinerator subject to capacity and monetary constraints for an example. (Author abstract modified)

31518 APTIC NO. 52974

Zimmerman, O. T.

DUST COLLECTORS. *Cost Eng., no. 17:4-5, Jan. 1972.*

Among the various types of dust collectors which are being used today are fabric filters, electrostatic precipitators, dry centrifugal collectors, and wet scrubbers. The latter are particularly advantageous in that they involve lower capital costs than dry collectors, can handle a wide range of particles from submicron to over 10 micron in diameter, and can remove many gaseous pollutants which would pass through dry collectors. The various types of wet collectors include centrifugal, orifice, spray tower, packed tower, flooded bed, flooded disk, wet dynamic, and low-, medium-, and high-energy venturi collectors. The capital cost of a dust collector depends on the particle size of the dust, and the capacity, efficiency, and construction materials of the unit. Also, to the purchase price must be added the cost of auxiliary equipment such as fans, pumps, and motors, as well as the cost of site preparation and foundations. For estimation purposes, the various types of collectors vary in cost from $1000 to $1,000,000; the purchase cost can be multiplied by 1.75 to get the installed cost.

1971

31519 APTIC NO. 53159

Jacobsen, Willis E.

A TECHNOLOGY ASSESSMENT METHODOLOGY. AUTOMOTIVE EMISSIONS. VOLUME 2. *Mitre Corp., Washington, D. C., Office of Science and Technology Contract 26, Proj. 1310, MTR 6009, 209p., June 1971. 62 refs.*

NTIS: PB 202778-02

The primary objective of the automotive emission control pilot study was to devise and to exercise by simple examples an assessment methodology aimed at alleviating a serious national environmental problem. The focus was upon testing of specific technological and institutional options which produced various levels of control of nationwide noxious automotive emission. The elements of societal cost determined were national mobility costs and costs of health degradation and economic damage. Some of the conclusions arrived at were: The 1968 automobile was responsible for 25% or less of the public health degradation and 6% of the property damage. Transportation (principally the automobile) in 1968 contributed 42% of the nationwide mass of noxious emissions; the types of pollutants from the automobile accounted for about 16% of the total damage to health and property. Seemingly small changes in technology or in emission control actions generally have large impacts upon society and the nationwide economy. Allowing several years for advanced emission control technology to impact over a broad age spectrum of the nation s automobiles, other sources of air pollution might predominate. Thus, pollution abatement activities must not center upon just the automobile but rather be extended to include all existent and potential sources of pollution. Otherwise, alternative sources such as off-the-road vehicles, trucks, buses, aircraft, trains, or even filling a gas tank (1-2% evaporative losses of hydrocarbons accompany fuel transfer) could soon surpass the controlled automobile engine as generators of noxious emissions. (Author summary modified)

STANDARDS AND CRITERIA

1973

31520 **APTIC NO. 52682**

Japan Environmental Agency, Air Quality Bureau

ESTABLISHMENT OF EMISSION STANDARD FOR NITROGEN OXIDES. *(Chissosankabutsu no haishutsu kijun no settei ni tsuite). Text in Japanese. 6p., July 30, 1973.*

The Japanese nitrogen dioxide/nitrogen oxides air quality standard was set on May 8, 1973. Main fixed emission sources such as boilers and mobile sources such as automobiles must be strongly regulated to meet the standard. Automobile emission regulations for 1973, 1975, and 1976 are increasingly strict. Boilers, industrial furnaces, and nitric acid manufacturing facilities are regulated. To attain the air quality standard, the NOx content in exhaust gases must be reduced to 1.63 to 1/10 the present amount.

31521 **APTIC NO. 52768**

Japan Environmental Agency

EMISSION STANDARD OF NITROGEN OXIDES FOR FACTORY. *(Chisso sankabutsu no kojo haishutsu kijun). Text in Japanese. Tsusansho Koho (Gaz. Minist. Int. Trade Ind.), no. 7117:1-3, Aug. 8, 1973.*

The Japan Environmental Agency revised the air pollution law enforcement act and regulations relative to the nitrogen oxides emission standard for fixed sources on Aug. 2, 1972. Large electric power, iron/steel, and petroleum industries which emit more than 40,000-100,000 cu m/hr of exhaust gases are regulated. This should reduce pollution by 20-40%. Boilers, industrial furnaces, and nitric acid manufacturing plants which emit NOx are regulated. Control methods for NOx include new burners, low oxygen operation, two-stage combustion and exhaust gas recirculation.

31522 **APTIC NO. 53271**

Japan Environmental Agency (Japan), Air Quality Bureau

ENVIRONMENTAL STANDARDS CONCERNING AIR POLLUTION. *(Taiki osen ni kakaru kankyokijun ni tsuite). Text in Japanese. Kankocho Kogaisenmon Shiryo (Public Nuisance Gaz.), 8(4):80-83, July 1973.*

Enforcement procedures and guidelines concerning new environmental criteria for nitrogen dioxide, photochemical oxidants, and sulfur dioxide in Japan are described. They meet the requirements of Level I proposed by the World Health Organization. Sampling must be done to represent typical air pollution at 1.5-10 m above the ground or above 10 m in the case of an apartment building. The measurement methods specified are conductometric, Saltzman photometric, and potassium iodide photometric or conductometric analyses for SO2, NO2, and oxidants, respectively. Nitrogen dioxide and nitric oxide should be measured together with oxidants and should be taken into account when determining oxidant concentrations. The new SO2 and NO2 criteria must be met within 5 years, except the period may be extended under some circumstances to 8 years for NO2.

31523 **APTIC NO. 53277**

Japan Environmental Agency, Air Quality Bureau

ESTABLISHMENT AND REVISION OF ENVIRONMENTAL STANDARDS CONCERNING AIR POLLUTION. *(Taikiosen ni kakaru kankyokijun no settei oyobi kaitei ni tsuite). Text in Japanese. 4p., April 1973.*

The recommendations on revision of the existing Japanese environmental standards for sulfur oxides, particularly sulfur dioxide, and establishment of environmental standards for nitrogen oxides and photochemical oxidants are discussed. The new environmental criteria recommended are considered desirable to protect human health. For example, the threshold value of the new environmental SOx criterion is about one-third of the existing standard; that for NOx is 0.02 ppm for daily average of hourly values compared with 0.04-0.05 ppm in Rotterdam and the Soviet Union or the annual average of 0.05 ppm in the U.S.A. The revised environmental criterion for SO2 is 0.04 ppm or lower in terms of a daily average or hourly values, or 0.1 ppm or lower in an hourly value; the new criterion for photochemical oxidant 0.06 ppm in an hourly value. Target periods in which the new criteria should be met are specified. The target period is 5 years for SO2 and 5 or 8 years for NOx. For photochemical oxidant, no target period is specified except the criterion should be met as soon as possible. Future programs that will help achieve the control criteria are also listed.

31524 **APTIC NO. 53242**

Dieterich, B. H.

THE CRITERIA OF POLLUTING SUBSTANCES IN THE CITIES AND THE GUIDE TO REGULATE THE POLLUTANTS. *(Toshi ni okeru taiki osen busshitsu ni kansuru hantei joken to shishin). Text in Japanese. Kankocho Kagaisenmon Shiryo (Public Nuisance Gaz.), 8(3):47-62, 1973. 47 refs.*

Criteria and regulations for pollutants are discussed as decided by the World Health Organization meeting in Geneva, Switzerland, on April 5-11, 1972. Toxic effects (acute and chronic), the effects of sulfur dioxide on plants, floating dust effects, carbon monoxide effects, photochemical oxidant and nitrogen oxide effects, and the results of various studies on the effects of pollutants are mentioned.

31525 **APTIC NO. 53497**

Engdahl, Richard B.

A CRITICAL REVIEW OF REGULATIONS FOR THE CONTROL OF SULFUR OXIDE EMISSIONS. *J. Air Pollution Control Assoc., 23(5):364-375, May 1973. 41 refs.*

Problems associated with the ambient air quality standards for sulfur dioxide as designated by the Clean Air Amendments of 1970 are reviewed. The major problems are that low sulfur fuels and control equipment are not widely available to meet the standards, and the very low average annual values (0.03 ppm for primary standards and 0.02 ppm for secondary standards) are difficult and costly to measure. Areas in which production of local high sulfur fuels is an integral part of the local economy will be adversely affected. The initial efforts to control SO2 was made in London by a wet scrubbing process. Processes and equipment that work in a small scale operation often fail at larger plants. In some cases, e.g., the limestone dolomite injection, catalytic oxidation, and alkalized alumina sorption process, difficulties only arise after the process is in operation. In that case, the sorbent material deteriorated. Installations become obsolete by the time they are installed and capital costs range from $60 to $100 per kw. A typical time scale for process development may take 4-13 years and includes bench scale experiments, prototype plant operation, and commercial plant design. Current thinking favors adding a limestone slurry to a scrubber. This requires devising improved scrubbers with high contact efficiency and long retention time. In view of the lack of proven methods or processes for removing SO2 from flue gases, consideration is recommended in encouraging the use of tall stacks, where appropriate, as an interim approach to help reduce ground level concentrations of SO2. Emission standards and fuel standards for coal and oil are listed.

31526 **APTIC NO. 52936**

Fri, Robert W.

THE 1975 MOTOR VEHICLE EXHAUST EMISSION STANDARDS. APPLICATIONS FOR SUSPENSION. *Federal Register, 38(146):20365-20372, July 31, 1973.*

The Environmental Protection Agency has granted a one year suspension of the 1975 statutory exhaust emission standards to 27 foreign automobile manufacturers. Five of the companies do not manufacture their own engines and are completely dependent on their engine suppliers to provide them with emission control systems which meet the standards. Others are small and must depend heavily on the component manufacturers to develop devices which can be added to their engines in order to meet the standards. Many of the companies have obtained contracts from catalyst manufacturers; others have been assured that provision of catalysts will not be a problem. All applicants are subject to the 1975 interim standards (Federal and California) for hydrocarbons, carbon monoxide, and nitrogen oxides. A separate review of each applicant's emission control research and development program is included in an appendix.

31527 **APTIC NO. 53468**

Fri, Robert W.

CONTROL OF AIR POLLUTION FROM AIRCRAFT AND AIRCRAFT ENGINES - PROPOSED EMISSION STANDARDS FOR IN-USE AIRCRAFT AFTER JANUARY 1, 1983. *Federal Register, 38(136):19050, July 17, 1973.*

A proposed Environmental Protection Agency retrofit program for aircraft engines is designed to reduce emissions from large commercial aircraft on the earliest schedule that is both technically and economically practicable. Final standards, which are being published in the Federal Register concurrently with the present notice of proposed rule making, have specified limits on emissions from a variety of new and in-use aircraft engines. These standards were derived following extensive analysis of comments submitted in response to a Dec. 12, 1972 proposal. One change from the proposal was to adjust the emissions limits required for newly manufactured engines in 1979 upwards to levels which match the goals of research projects presently planned and in progress within the National Aeronautics and Space Administration and the Air Force. These levels, though somewhat less stringent than those first proposed by EPA, have the advantage of being achievable by design approaches which do not significantly increase the space requirements of the combustor sections of existing engines.

31528 **APTIC NO. 52716**

Hamanaka, Hironori

THE ENVIRONMENTAL STANDARD FOR NITROGEN DIOXIDE AND PHOTOCHEMICAL OXIDANT. *(Nisanka chisso narabini kokagaku okisidanto no kankyo kijun ni tsuite). Text in Japanese. PPM (Japan), 4(7):67-73, July 1973.*

Environmental standards set by the Japanese government for nitrogen dioxide and photochemical oxidants are reviewed and compared with those in the United States, the USSR, and the World Health Organization. The standard values were set at 0.02 ppm for NO2 and 0.06 ppm for the oxidants as the daily average/hr. As compared with the standards for the U. S. (0.05 ppm), the USSR (0.042 ppm), and the Netherlands (0.05 ppm), the Japanese NOx standards are more stringent and are based on considerations of the special circumstances in Japan where sulfur dioxide coexists with NO2 in almost all polluted districts. The standard value for oxidants was based on threshold limits beyond which acute eye irritation and respiratory irritation occur. The corresponding standards are 0.06 ppm in the U. S., 0.05 ppm in Canada, and 0.06 ppm for WHO.

31529 **APTIC NO. 52921**

Hino, Yoshinori

NATIONAL AMBIENT STANDARDS OF NITROGEN OXIDES. *(Chisso sankabutsu no kenkyo kijun). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(8):35-40, Aug. 1973.*

Nitrogen oxides, NOx standards in Japan and the U. S., photochemical smog, and measurement of NOx are discussed. The 1-hour air quality standard for NOx is 0.02 ppm/day. This value should be reached no more than 60% of the year. Spectrophotometry using the Saltzman reagent is the measurement method for NOx. In most Japanese cities, nitrogen dioxide exceeds 0.02 ppm. But the standard is supposed to be reached in 5 or 8 years, depending on the area. Photochemical oxidant standards are listed. The 1-day value should be no more than 0.06 ppm.

31530 **APTIC NO. 52815**

Kamens, Richard M. and Arthur C. Stern

METHANE IN AIR QUALITY AND AUTOMOBILE EXHAUST EMISSION STANDARDS. *J. Air Pollution Control Assoc., 23(7):592-596, July 1973. 34 refs. (Presented at the Air Pollution Control Assoc., Annual Meeting, 65th, Miami Beach, Fla., June 1972. Paper No. 72-186.)*

Differences in the evolution of the measurement of hydrocarbons in the atmosphere and in motor vehicle emissions have resulted in the present situation in which atmospheric concentrations of hydrocarbons and the national air quality standards for hydrocarbons are reported on a nonmethane (excluding methane) basis whereas motor vehicle emission concentrations are reported on a total hydrocarbon (including methane) basis. These differences in measurement technology, the reasons for their having arisen, and their influence on the setting of the 90% hydrocarbon requirement of the Clean Air Amendments of 1970 and on the Environmental Protection Agency 1975 motor vehicle emission standard for hydrocarbons are discussed. It is concluded that the 1975 motor vehicle emission standard for hydrocarbons should reflect only the nonmethane portion of the total hydrocarbon emissions. A possible method for developing these standards is given. (Author abstract modified)

31531 **APTIC NO. 52853**

Oba, Hideki

AUTO EXHAUST CONTROL TOWARD HEALTH PROTECTION. *(Jidosha haikigasu taisaku ga towareteirumono). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(7):654-660, July 1973. 10 refs.*

The U. S. Muskie law was applied to a Japanese law which calls for reduced carbon monoxide and hydrocarbons in 1975 automobile exhaust (1/10th the 1972 levels) and reduced nitrogen oxides after April 1976 (1/10th the 1972 levels). Since Japan has an even more serious pollution problem than the U. S., even stricter regulations will be necessary.

31532 **APTIC NO. 53521**

Ruckelshaus, William D.

THE 1975 AUTO EMISSION STANDARDS. *Environ. News, April 11, 1973. 7 refs.*

It is believed that the oxidation catalyst is workable and that the catalyst is the technology that must be used if statutory standards regarding automotive emissions are to be met by 1975. Public interest dictates that the catalysts be phased into use by 1975 by setting standards in California that will require their use on all domestic automobiles sold there in 1975 and by further setting an interim standard for the rest of the nation that will likely result in some catalysts used on some models nationwide by 1975. The decision to phase in the catalyst is based on the potential societal disruption involved in attempting to apply this new technology across all car lines in one year. California is the logical place in which to initiate the use of catalysts for a number of reasons, including the fact that it has an especially serious air quality problem. The standards for California in 1975 will require catalysts on substantially all cars sold in the state in that year, while those for the rest of the nation will require few catalysts. Cars produced in 1975 in California will achieve a 90% reduction in hydrocarbons and carbon monoxide compared with uncontrolled cars, and those produced in the rest of the country will achieve an 83% reduction. These reductions will move California two-thirds of the way to the 1975 standards and the rest of the country half of the way to the 1975 standards. The California standards are designed to insure the utilization of the catalyst without running the risk of failure in certification and production. The phase in of the catalyst will substantially reduce automotive emissions and will allow the marketplace to serve as a strong impetus to the testing of new technologies without creating economic turmoil.

31533 **APTIC NO. 53264**

Shoda, Yukio

ON ESTABLISHMENT OF ENVIRONMENTAL STANDARDS CONCERNING NITROGEN DIOXIDE. *(Nisankachisso ni kakaru kankyokijun no settei ni tsuite). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 2(8):14-20, Aug. 1973.*

The toxic effects of nitrogen oxides, photochemical oxidants, and ozone were studied to determine air quality standards and criteria for these pollutants. Effective May 8, 1973, the Japanese nitrogen dioxide air quality criterion was set at 0.02 ppm or less daily average 1-hour value as measured by the Saltzman absorption photometric method. Implementation guidelines are mentioned including measurement instruments, meteorological conditions, and emission source factors. A daily average value should not be taken as a basis of the short-term evaluation if it only represents 1-hour values for less than 17 hours of the day. For the long-term appraisal, the criterion for NO2 must, as a rule, be met within 5 or 8 years, depending on circumstances.

1971

31534 **APTIC NO. 53133**

VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany), Kommission Reinhaltung der Luft

GUIDELINES FOR EMISSION LIMITATION BY WASTE INCINERATORS WITH THROUGHPUT CAPACITIES OF UP TO 1500 KG/H. *(Auswurfbegrenzung- Abfallverbrennungsanlagen mit Durchsatzleistungen bis zu 1500 kg/h). Text in German. VDI (Ver. Deut. Ingr.) Richtlinien, no. 2301.1-12, Aug. 1971 56 refs.*

The guidelines for incinerators with a throughput up to 1500 kg waste/hr are designed primarily for hospitals and commercial incinerators, not for municipal incinerators, for the combustion of oil-containing wastes, or for electrical incinerators of small size; optimal combustion temperature should be at least 800 C, gaseous effluents should remain in the combustion zone for at least 2 to 3 sec, admissible flue gas temperature is up to 300 C; moist waste gas volume should be from 5 to 8 cu m N/kg waste without cooling air, from 15 to 25 cu m N/kg waste including cooling air; fly ash content in gas leaving furnace should be 0.2 to 5 g cu m; sulfur dioxide content in gas leaving furnace should be up to 3000 mg cu m; hydrogen chloride content up to 2000 mg cu m N. Emission of pollutants can be reduced by matching incinerator characteristics with the waste quantity and quality to be processed, by removing dust and suspended particulates from waste gas by cyclones, and by construction of high stacks in order to reduce pollution concentration at ground level. If high stacks cannot be built of if HCl concentration in waste gas exceeds 5 g cu m N, waste gas purification has to be resorted to either by washing towers or by blowing alkaline dusts into the furnace. The effects of the caloric content of waste, of supplemental fuel addition, of the combustion chamber construction, of a secondary combustion chamber, and of the stack on emission of pollutants are evaluated.

LEGAL AND ADMINISTRATIVE

1973

31535 **APTIC NO. 52745**

FIFTH EXECUTIVE REGULATION OF THE MINISTER FOR HEALTH IN THE GERMAN DEMOCRATIC REPUBLIC PERTAINING TO THE LAW ON MAINTENANCE OF CLEAN AIR FROM JANUARY 17, 1973. *(Fuenfte Durchfuehrungsverordnung des Ministers fuer Gesundheitswesen der Deutschen Demokratischen Republik zum Landeskulturgesetz -- Reinhaltung der Luft -- vom 17. January 1973). Text in German. Z. Lebensm. Unters. Forsch. (Munich), 152(4):115-117, 1973.*

A regulation issued by the East Germany Minister of Health calls for research and development in the field of air pollution as well as for working out maximum allowable emission concentrations. During extraordinary emission situations, the Chairman of the Council of Ministers has the right to ask for limitation of environment-polluting activities such as the operation of furnaces and cars, or he might order a switch to different kinds of fuels. Managers of plants which produce air pollutants must see that preventive devices are available which enable plant operators to fulfill the legal requirements for maintenance of clean air. Emitters of air pollutants are required to comply with the established emission limit values. Hygiene inspectors perform the emission inspections. They are entitled to give orders concerning maintenance of emission limit values. Emitters are required to monitor their own sources, and they must pay for damages resulting from noncompliance with the existing emission regulations. The district hygiene inspectors have to furnish an annual report on the results of emission inspections. A table listing the long-term and short-term maximum allowable emission concentrations is given. For example, the long-term maximum allowable emission concentration for lead and its compounds (with the exception of tetraethyl lead) is 0.0007 mg/cu m, for chlorine 0.03 mg/cu m, for hydrogen fluoride 0.005 mg/cu m, for sulfur dioxide 0.15 mg/cu m, for nitrogen oxides 0.04 mg/cu m, and for carbon monoxide 1 mg/cu m.

31536 **APTIC NO. 52780**

Japan Environmental Agency, Air Quality Bureau

GUIDANCE FOR INVESTIGATIONS OF THE EFFECT OF AIR POLLUTION DUE TO PHOTOCHEMICAL REACTIONS ON HEALTH. *(Kokagaku hanno ni yoru taiki osen kenko eikyo chosa jisshi yoryo). Text in Japanese. 6p., July 1973.*

The guidelines for epidemiological investigations of the effects of photochemical pollution commissioned by the Japan Environmental Agency for 1973 are presented. The investigators will be staff members of the National Cancer Research Center, the National Institute of Public Health, Department of Health of Osaka, Hyogo Prefectural Government, Keio

University Medical School, and Kitazato Research Inst., with the cooperation of the Tokyo Metropolitan government. The examinees will be various occupational groups, residents, and schoolchildren along the Tokyo and Osaka Bays. The investigations will be conducted during photochemical seasons of summer to early fall, and during the control season. As a basic data for clinical investigations, all data concerning health damage incidents diagnosed as the result of photochemical smogs will be collected and classified by staff members of the Japan Public Health Association and the Tokyo University Medical School. The results are to be summarized in report forms by leaders of investigation teams and to be presented to the Japan Environmental Agency by March 15, 1974.

31537 APTIC NO. 52854

Ministry of International Trade and Industry (Japan); Chiba Prefectural Government (Japan); and Industrial Public Nuisance Control Assoc. (Japan)

A REPORT OF AIR POLLUTION COUNTERMEASURE IN THE KEIYO AREA. *(Keiyo-chiku taikiosen boshi taisaku hokoku). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 9(7):665-681, July 1973.*

Countermeasures against air pollution were studied for the Tomizu, Kimizu, and Nagaura areas in Chiba Prefecture and for the Keiyo industrial area. Because of secondary pollution with the improved plans, high concentrations of pollution will disappear, but some pollution will remain. During the period of the investigation, sulfur dioxide dropped from 0.170 ppm to to 0.065 ppm in Nagaura, Kimizu, and Tomizu. In Goianezaki, pollution dropped from 0.056 ppm to 0.041 ppm. If the control plan is obeyed, the sulfur oxides environmental standard will be met, even under bad weather conditions. The air in the Tomizu area should be lowered to less than 0.030 ppm on the basis of recent policies. The effects of wind and stability on pollution are discussed.

31538 APTIC NO. 52857

Japan Environmental Agency, Air Quality Bureau

THE PLANS AGAINST PHOTOCHEMICAL SMOG FOR THE FISCAL YEAR 1973. *(Showa 48 nendo ni okeru kokagaku sumoggu taisaku ni tsuite). Text in Japanese. Kankocho Kogaisenmon Shiryo (Public Nuisance Gaz.), 8(3):98-101, May 1973.*

Photochemical smog, control methods, measurements of pollution (including aldehydes, sulfuric acid mist, oxidants, nitrogen dioxide, and hydrocarbons), and sources are discussed. Laser radar techniques for the simultaneous measurement of pollutants over a wide area are being developed. The formation mechanism of photochemical smog in relation to meteorology is described. The effects of oxidants (especially ozone) on plants and humans are described. Many plans have been proposed to prevent smog, including air quality standards for NO2 and oxidants, emission standards for nitrogen oxides and automobiles, and elimination of leaks of hydrocarbons from industrial plants. Old cars will require retrofit control units to meet new standards. Ignition timing should be adjusted to control HC and NOx. Low taxes will be used to push the purchase of low-pollution automobiles. Development of low-pollution automobiles such as the electric car and the hybrid engine car and of new control methods are being carried out. Traffic controls, improved mass transportation, and the development of goods distributing centers to reduce the need for trucks are discussed. The relation of air pollution to city structure, redistribution of the industrial area, construction of new circular roads, air pollution forecasting, health examinations, and international cooperation are also discussed.

31539 APTIC NO. 53028

INTERIM REGULATION CORRECTION. *Federal Register, 38(119):16220, June 21, 1973.*

A correction is given for Title 40 - Protection of Environment, Chapter I Environmental Protection Agency, Subchapter B - Grants, Part 40 Research and Demonstration Grants (Federal Register for May 15, 1973, page 12786). The change occurs in section 40.125-1, Limitations on Duration.

31540 APTIC NO. 53431

Foster Associates, Inc., Washington, D. C.

AN ANALYSIS OF THE REGULATORY ASPECTS OF FUEL OIL SUPPLY (ABRIDGED REPORT). *Office of Air and Water Programs Contract 68-02-0640, Pub-APTD-1460, 60p., March 1973. 2 refs.*

NTIS: PB 221403

The current Federal, state, and local regulatory picture affecting the supply and distribution of natural gas and low sulfur fuel oil is discussed. The possible changes in this regulatory picture and alternate regulatory strategies which could bring about increased supplies of these clean-burning fuels are mentioned. Present regulatory means of increasing low sulfur fuel oil supply are extremely limited, and new legislation may be needed to increase crude and fuel oil supply. Possible legislative measures fall into two broad categories -- new incentives to increase domestic oil production and refining and new measures to reduce consumption of oil and its products. New tax incentives and research and development support are seen as the most palatable solution. Measures to reduce consumption such as the promotion of mass transit and requirements for better insulation on houses appear to be desirable and have other important benefits. Ultimately, substantial selective fuel taxes to reduce consumption will probably be needed. The establishment of a Mandatory Oil Import Program is described.

31541 APTIC NO. 52937

Davis, Benjamin O., Jr. and Robert W. Fri

ENVIRONMENTAL PROTECTION AGENCY (40 CFR PART 62). LOS ANGELES AREA TRANSPORTATION CONTROL PLAN. BUS/CARPOOL LANES. *Federal Register, 38(147):20469, Aug. 1, 1973.*

A proposed Environmental Protection Agency transportation strategy for the Los Angeles area would require that on streets and highways with three lanes in one direction, one of these lanes be set aside for exclusive bus/carpool use during rush hours. On streets and highways with four lanes in one direction, one lane would be set aside for bus/carpool use 24 hr/day and a second lane would be similarly set aside during rush hours. The Department of Transportation believes that this approach would not be effective in reducing vehicle miles of travel and would have severe safety and enforcement problems. A better approach would be to set aside all lanes on limited access roads, and all lanes on selected nonlimited access arterials, for exclusive bus/carpool use during peak hours. On selected additional arterials and central business district streets, one lane would be set aside during the peak hours for exclusive use of buses only. Curb parking on such streets would be prohibited during rush hours.

31542 APTIC NO. 52763

Engel, Alfred, Irwin Feller, and Robert Friedman

INTERGOVERNMENTAL RELATIONS IN AIR POLLUTION RESEARCH. *J Air Pollution Control Assoc., 23(6):528-529, June 1973. 3 refs.*

Under existing Federal legislation, responsibility for attaining national air quality objectives are shared between the Federal government and the states, with a lesser role assigned to municipalities. Research on air pollution is centralized at the Federal level. The applicability of Federally-sponsored research to the operational needs of state and local control agencies and the role of such agencies in the administration and performance of research and development is discussed. Various state, local and Environmental Protection Agency officials were interviewed and their opinions are discussed. State and municipal officials acknowledge that the Federal government is better able than state and local units to support, administer, and perform research and development. Some tend to emphasize the feasibility of a rollback approach in which existing technology, with limited additional research and development would be applied to achieve air quality standards. Others regard further research and development as necessary.

31543 **APTIC NO. 53137**

Eschenroeder, A. Q., G. W. Deley, and R. J. Wahl

FIELD PROGRAM DESIGNS FOR VERIFYING PHOTOCHEMICAL DIFFUSION MODELS. *General Research Corp., Santa Barbara, Calif., Environmental Protection Agency Contract 68-02-0336, EPA-R4-73-012, Vol. c, CR-3-273, 50p., March 1973. 18 refs.*

NTIS: PB 221300

Field program designs for verifying photochemical diffusion models are presented along with three specific conceptual plans that can be pursued to shed further light on certain key questions that remain unanswered regarding automotive emissions along major highways, the study of photochemical transformations, and spatially integrated sampling. A data management plan, using the Los Angeles Reactive Pollutant Program (LARPP) design as a prototype, is also presented to aid ongoing program direction in addition to providing an archive for modelers. Brief overviews of future field program objectives include the definition of the role of aerosols in atmospheric chemistry and further understanding of gas phase processes affecting reaction rates.

31544 **APTIC NO. 53066**

Fri, Robert W.

OREGON: APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. NOTICE OF PROPOSED RULE MAKING. *Federal Register, 38(148): 20766-20768, Aug. 2, 1973.*

The transportation control plan submitted by Oregon for attainment of the primary national ambient air quality standards for carbon monoxide and photochemical oxidants is reviewed, and additional regulations are set forth which could be implemented in addition to the approved portions of the Oregon plan. The measures indicated in the Oregon plan include: annual inspection to determine emissions from and maintenance required for gasoline powered light duty vehicles with a contingency retrofit provision; traffic flow improvements with contingency provisions including alteration of the hours for loading and servicing of off peak times; control of evaporative losses from filling vehicle tanks; public transportation improvements; and reorganization and management of parking. In developing the transportation control strategies it submitted, the state used a proportional mathematical model to establish the maximum emission densities allowable if the 8-hour national standard for carbon monoxide is to be attained and maintained. This model indicated that the central business district of Portland is the only area in which this standard would be exceeded in 1975. Because of deficiencies in the state plan for this region, the following Federal regulations are proposed to implement the state plan: establishment of a system of traffic lanes for the exclusive use of buses and car pools; and institution of a daylight delivery ban that will alter the hours heavy duty gasoline powered motor vehicles are allowed to make deliveries in the Portland central business district. Although these regulations along with the state measures will eliminate the danger to human health and welfare in this area, they may have adverse economic and social impacts; efforts will be made to mitigate these adverse effects. Public comments, both testimonial and written, regarding the proposed federal regulations are solicited.

31545 **APTIC NO. 53067**

Fri, Robert W.

VIRGINIA: APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. NOTICE OF PROPOSED RULE MAKING. *Federal Register, 38(148): 20789-20794, Aug. 2, 1973.*

The transportation control plan submitted by Virginia for attainment of the primary national ambient air quality standards for carbon monoxide and photochemical oxidants is reviewed and additional regulations are set forth which could be implemented in addition to the approvable portions of the Virginia plan. Preliminary review of the plan by EPA indicates that the following strategies are likely to be approved: the Federal Motor Vehicle Control Program; the Virginia motor vehicle inspection and maintenance program of light duty vehicles; improvements in public transit; increased terminal or parking charges, and the bus/locator program. The proposed restrictions on aircraft ground operations appear to be partially approvable, while the proposed increased control of stationary source emissions is not approvable. Thus EPA is proposing the following measures: initiation of commercial type parking rates or reduction of the available spaces at certain government facilities; retrofit by 1975 of all pre-1968 vehicles with a vacuum spark advance disconnect kit; retrofit of light duty 1971-1975 fleet vehicles and taxicabs with an oxidizing catalyst retrofit; controls of emissions of hydrocarbons due to gasoline handling; ban of heavy-duty gasoline powered vehicles during certain hours. Also, if the $2 surcharge proposed by Virginia is not implemented, the following measures are proposed: a ban on constructing or enlarging any parking space without a permit; and a phased 15% reduction in the number of off-street parking spaces. A 2-year extension for the attainment of the standards in Virginia is proposed. The social and economic consequences of the measures included in the Virginia plan or proposed herein are considered reasonable. The comments and suggestions of the public on the problems of achieving the ambient air quality standards in Virginia are desired.

31546 **APTIC NO. 53068**

Fri, Robert W.

CLEAN AIR ACT. ADMINISTRATION REGARDING FEDERAL CONTRACTS, GRANTS, OR LOANS. *Federal Register, 38(119):16241-16242, June 21, 1973.*

Regulations relating to the administration of the Clean Air Act with respect to Federal contracts, grants, or loans are set forth. The written comments of interested persons are solicited.

31547 **APTIC NO. 53070**

Fri, Robert W.

APPROVAL OF PLAN REVISIONS. *Federal Register, 38(120):16351-16352, June 22, 1973.*

Two proposed revisions for Rhode Island s plan for implementation of the national ambient air quality standards have been submitted by Rhode Island and approved by the EPA. According to the first 0revision, the March 31, 1975 date set for attainment of the primar and secondary particulate standards will be changed to May 31, 1975. The former compliance schedule requiring that all existing incinerators comply with an applicable emission limitation no later than Feb. 28, 1975 has also been revised. As revised, incinerators with less than 2000 lb/hr input capacity must be in compliance by Jan. 31, 1974, and incinerators with more than 2000 lb/hr input capacity must be in compliance by May 31, 1975. These actions are effective immediately upon publication of this notice

31548 **APTIC NO. 53071**

Fri, Robert W.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS TRANSPORTATION CONTROL MEASURES; CORRECTION OPPORTUNITY FOR PUBLIC

COMMENT ON PROPOSED TRANSPORTATION AND/OR LAND USE CONTROL STRATEGIES. *Federal Register, 38(149):20851-20852, Aug. 3, 1973.*

The transportation control regulations proposed on July 2 and 3, 1973 for preconstruction review of parking facilities in California, New Jersey, Minnesota, and Texas are corrected to render the wording consistent with other proposed regulations for parking facilities. Also, public notice is given that revisions for the proposed transportation control plans submitted by Colorado and the District of Columbia have been received. Comments may be submitted on whether the proposed plans, as revised, should be approved or disapproved. The revisions submitted by the District of Columbia are to correct original deficiencies regarding the regulatory, administrative, and enforcement aspects of some of the proposed strategies. The revisions submitted by Colorado contain: supplemental information confirming the state s intent to undertake certain control measures submitted earlier: copies of certain existing legal authority and proposed regulations: and other information. Copies of the two sets of revisions are available.

31549 **APTIC NO. 53084**

Fri, Robert W.

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. LIGHT DUTY TRUCKS AND DIESEL-POWERED VEHICLES. *Federal Register, 38(151):21348-21380, Aug. 7, 1973.*

Part 85 of Chapter 1, Title 40 of the Code of Federal Regulations as applicable to the control of air pollution from 1975 and later model year diesel powered light duty vehicles and gasoline fueled light duty trucks is presented in its amended form; it is effective on Sept. 6, 1973. The stated regulations cover: general standards; hearings on certification; maintenance of records, emission standards for 1975 model vehicles and trucks; application for certification; approval of procedure and equipment; required data; test vehicles and trucks; maintenance; mileage accumulation and emission measurements; special test procedures; diesel fuel and gasoline specifications; vehicle and truck preparation and preconditioning; dynamometer driving schedule; dynamometer procedure; three-, four-, and five-speed transmissions; automatic transmissions; engine starting and restarting; sampling and analytical system; information to be recorded; analytical system calibration and sample handling; dynamometer test runs; chart reading; calculations (exhaust emissions); compliance with emission standards; testing by the Administrator; certification; separate certification; addition of a vehicle after certification; changes to a vehicle covered by certification; alternative procedure for notification of additions and changes; labeling; submission of vehicle identification numbers; production vehicles; maintenance instructions; submission of maintenance instructions; and emission standards for 1976 model vehicles.

31550 **APTIC NO. 53085**

Fri, Robert W.

MARYLAND, (PRINCE GEORGES AND MONTGOMERY COUNTIES) APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS NOTICE OF PROPOSED RULE MAKING. *Federal Register, 38(148):20779-20784, Aug. 2, 1973.*

The transportation control plan submitted by Maryland for attainment of the primary national ambient air quality standards for carbon monoxide and photochemical oxidants is reviewed and additional regulations are set forth which could be implemented in addition to the approved portions of the Maryland plan. Preliminary review of the plan by EPA indicates that the following strategies are likely to be approvable the Federal motor vehicle control program, improvements in public transit, increased terminal or parking charges, and the bus/carpool locator program. The proposed restrictions on aircraft ground operations appear to be partially approvable. The motor vehicle inspection program is approvable in concept, but an acceptable implementation schedule is proposed to make it totally approvable. The proposed increased control of stationary source emissions does not appear approvable because of a lack of adopted regulations, and the proposed heavy duty restraints do not appear approvable because of a lack of documented technical feasibility. EPA proposes the following measures: initiation of commercial type parking rates or reduction of the available spaces at certain government facilities; retrofit of all pre-1968 vehicles with a vacuum spark advance disconnect kit; retrofit of light duty 1971-1975 fleet vehicles and taxicabs with an oxidizing catalyst retrofit; controls of hydrocarbon emissions due to gasoline handling; ban of heavy-duty gasoline powered vehicles during certain hours. Also, if the $2 surcharge proposed by Maryland is not implemented, a ban on constructing or enlarging any parking space without a permit and a phased 15% reduction in the number of off-street parking spaces are proposed. A 2-year extension for the attainment of the national standards in Maryland is proposed. The social and economic consequences of the measures included in the Maryland plan or proposed herein are considered reasonable. The comments and suggestions of the public regarding the problems of achieving the ambient air quality standards in Maryland are desired.

31551 **APTIC NO. 53086**

Fri, Robert W.

DISTRICT OF COLUMBIA; APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. NOTICE OF PROPOSED RULE MAKING. *Federal Register, 38(148):20758-20762, Aug. 2, 1973.*

The transportation control plan submitted by the District of Columbia (D. C.) for attainment of the primary national ambient air quality standards for carbon monoxide and photochemical oxidants is reviewed and additional regulations are set forth which could be implemented in addition to the approved portions of the D. C. plan. The following strategies appear to be approvable by EPA: the Federal Motor Vehicle Control Program, the motor vehicle inspection program, improvements in public transit, increased terminal or parking charges, the bus/carpool locator program, and selective control of goods movement. The proposed restrictions on aircraft ground operations appear to be partially approvable, while the increased control of stationary source emissions is not approvable due to a lack of adopted regulations. The EPA proposes the following measures: initiation of commercial type parking rates or reduction of available spaces at certain government facilities; retrofit of all pre-1968 vehicles with a vacuum spark advance disconnect kit; retrofit of light duty 1971-1975 fleet vehicles and taxicabs with an oxidizing catalyst retrofit; controls of hydrocarbon emissions due to gasoline handling; and further controls over dry cleaning operations. Also, if the $2 surcharge proposed by D. C. is not implemented, a ban on constructing or enlarging any parking space without a permit and a phased 15% reduction in the number of off-street parking spaces are proposed. A 2-year extension for attainment of the national standards in D. C. is proposed. The social and economic consequences of the measures included in the D. C. plan or proposed herein are considered reasonable. The comments and suggestions of the public regarding the problems of achieving the national standards in D. C. are desired.

31552 **APTIC NO. 53087**

Fri, Robert W.

APPROVAL OF TRANSPORTATION AND/OR LAND USE CONTROLS. *Federal Register, 38(120):16550-16569, June 22, 1973.*

The transportation control plans submitted by 22 states and the District of Columbia for attainment of the national ambient air quality standards are reviewed with regard to their approval or disapproval by EPA, and the available transportation control alternatives are discussed. These alternatives include: mass transit; car-pooling; reductions in the vehicle miles traveled; traffic flow improvements; vehicle inspection and maintenance; and use of retrofit control systems. Possible economic and social impacts of the control strategies are discussed, along with the bases upon which extensions may be granted for achievement of the national standards. Typical comments which have been received regarding the state plans are reviewed, as are the future actions which will be required of the states and the effect of the Federal Motor Vehicle Emission program on the state plans. The control plants of Alabama and New York have been fully approved, and those of Kansas, Louisiana, and Missouri will be fully approvable following the expiration of the comment period. The following submitted plants with generally approvable control strategies but with procedural deficiencies: Arizona, District of Columbia, Illinois, Oregon, Pennsylvania, Utah, Virginia, and Washington. Inadequate plans were submitted by Maryland and Texas, and that of Colorado was submitted too late for evaluation. No plans were submitted by California, Indiana, Massachusetts, Minnesota, New Jersey, Ohio, or Alaska. A discussion of the specific actions relevant to each state is given, and the disapproved portions or each plan are provided along with an explanation of the basis for disapproval. Plans for Alabama, Kansas, and Louisiana are also mentioned.

31553 **APTIC NO. 53088**

Fri, Robert W.

MARYLAND: APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. NOTICE OF PROPOSED RULE MAKING. *Federal Register, 38(148):20769- 20774, Aug. 2, 1973.*

Regulations which could be implemented in addition to the transportation control plan submitted by Maryland for attainment of the primary national ambient air quality standards for carbon monoxide and photochemical oxidants are set forth. Portions of the Maryland plan were not approved because the justification for claimed reductions and the procedures for administration, enforcement, and monitoring of the strategies were not adequate. The EPA proposes regulations to: prohibit Maryland from registering or allowing the operation of vehicles which cannot show proof of satisfactorily passing a loaded emission test; establish exclusive bus/carpool lanes; restrict on-street parking; restrict the establishment of additional parking facilities; require the establishment of a bus/carpool computer matching system; require the retrofit of all pre-1968 vehicles with a vacuum spark advance disconnect kit; require retrofit of light duty 1971-1975 fleet vehicles and taxicabs with an oxidizing catalyst retrofit; limit gasoline sales; and reduce hydrocarbon loss during the transfer of gasoline. These strategies combined with the Federal Motor Vehicle Control Program will allow the achievement of the national ambient air quality standards for carbon monoxide and photochemical oxidants by May 31, 1977. EPA is also considering control measures such as: phased reductions of public parking facilities; motorcycle limitation programs; the expanded use of existing rail right-of-way; and the establishment of bikeways. In addition, EPA may increase the stringency of the following proposed regulatory measures: the inspection and maintenance regulations; and regulations for organic solvent use and degreasing operations. Some or all of these strategies may be included in EPA s final promulgation. Socioeconomic impact is discussed.

31554 **APTIC NO. 53095**

Fri, Robert W.

SUBMISSION OF STATE REPORTS AND EMISSION CONTROL ACTION PROGRAMS. *Federal Register, 38(149):20832-20834, Aug. 3, 1973.*

Two sections of the regulations for the preparation, adoption, and submittal of the state implementation plans of the national ambient air quality standards were amended: Section 51.7, Reports; and Section 51.16, Prevention of Air Pollution Emergency Episodes. The former was modified in the following ways: the number of sources for which emissions and plan enforcement data need by submitted has been reduced to include only those emitting more than 100 tons per year; the reporting requirements for sources listed in Appendix C of the Nov. 25, 1971 SIP regulations has been deleted; states will not be required to submit only substantive nonregulatory revisions of the plan to the EPA with the semi-annual report; the requirement that general information on plan progress be submitted to the EPA has been deleted; the requirement for reporting all enforcement actions has been changed to limit reporting to those enforcement actions which result in civil or criminal penalties; states will now be required to submit emission data for those sources which were approved for construction during the reporting period; both the EPA and individual states will now be required to monitor the progress of point sources under enforcement orders and compliance schedules: and enforcement orders must now be submitted within 60 days of their issuance. The requirement that states negotiate and submit to EPA the emergency emission control action programs for individual sources was deleted. The states are still encouraged to develop individual emission control action programs for major stationary sources. Comments relating to these amendments expressed concern over the use of the NEDS emission data format and EPA s need for detailed air quality measurements rather than data summaries. The need for the latter was explained, and solutions relating to the use of the NEDS format were offered.

31555 **APTIC NO. 53096**

Fri, Robert W.

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. NOTICE OF OPPORTUNITY FOR PUBLIC COMMENT ON PROPOSED TRANSPORTATION AND/OR LAND USE CONTROL STRATEGIES. *Federal Register, 38(120):16391- 16392, June 22, 1973.*

Public notice is given that a proposed plan for implementation of the national ambient air quality standards by the state of Colorado has been received by the EPA and that comments may be submitted on whether the proposed transportation and land use control strategies should be approved or disapproved. These control strategies are designed to achieve the ambient air quality standards for carbon monoxide and photochemical oxidants in the Metropolitan Denver intrastate air quality control region. Public comment is also solicited on whether Colorado s request for a 2 year extension of the time for meeting the primary standards should be granted. Colorado s plan presents a control strategy designed to achieve the national standards by 1975. The proposed control strategy provides for a 71% reduction in carbon monoxide and a 60% reduction in hydrocarbons. Specific strategies include: semiannual inspection and maintenance of all light duty vehicles; retrofits of 1955-1967 eight duty vehicles; high latitude modification and tuning for 1968-1974 light duty vehicles; restrictions on emissions of hydrocarbons from stationary sources: improvement in public transportation; voluntary bike usage; conversion of fleet vehicles to gaseous fuel; and vehicle use restraints expressed as gasoline rationing at a 33% level.

31556 **APTIC NO. 53166**

Fri, Robert W.

COLORADO: APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. NOTICE OF PROPOSED RULE MAKING. *Federal Register, 38(148):20752- 20754, Aug. 2, 1973.*

Regulations which could be implemented in addition to the transportation control plan submitted by Colorado for attainment of the primary national ambient air quality standards for carbon monoxide and photochemical oxidants are set forth. The selection of appropriate control strategies for the

Metropolitan Denver Region is complicated by the lack of data reflecting true emissions at Denver's high altitude. The strategies listed in the Colorado plan include: a semiannual inspection and maintenance program; air bleed retrofit for pre-1968 vehicles; high altitude modification and tuning specifications for 1968 1975 vehicles; designation of mandatory bus/carpool lanes; limitation on the construction of future parking facilities; removal of on-street parking in the core area; improvements in public transit; and expanded bikeway development and use. The EPA is proposing a limitation on gasoline sales to further reduce the vehicle miles traveled. Alternative strategies to achieve the same result include: limitation of auto use by means of colored license plates or stickers; and the use of catalytic converter retrofit. Although these regulations along with the state measures will eliminate the danger to human health and welfare in this area, they may have adverse economic and social impacts. While the principle effects will probably be largely a matter of social adjustment, efforts will be made to mitigate them. Public comments, both testimonial and written, regarding the proposed federal regulations are solicited.

31557 **APTIC NO. 53167**

Fri, Robert W.

APPROVALS AND DISAPPROVALS OF PLAN REVISIONS. *Federal Register, 38(149):20835-20836, Aug. 3, 1973.*

Amendments of the Federal Code of Regulations to accommodate proposed revisions of two state implementation plans (Vermont and Massachusetts) for the implementation of the national ambient air quality standards are stated and discussed. According to one revision, the Whitefield Paper Division of the Georgia Pacific Corporation would be allowed to burn fuel oil with an average of 2.25% sulfur (exceeding the 1.5% allowed maximum) from Oct. 1, 1972 to July 1, 1973. The revision was approved in that it was consistent with the Vermont implementation plan and stated the earliest practical time by which Georgia Pacific could acquire the low sulfur fuel necessary for compliance with the regulation. Also approved was a revision which would allow two facilities of the Newton Public Schools to operate coal furnaces until June 1 1973 (beyond the June 1, 1972 limit). This revision was consistent with the Massachusetts implementation plan and stated the earliest practical time by which the schools could comply with the regulation. A revision which would allow Pierce Brothers, Inc. of Waltham, Massachusetts to burn a maximum of 1.0% sulfur fuel from Oct. 1, 1972 to Oct. 1, 1973 (exceeding the 0.5% allowed maximum) was not approved. Massachusetts justifications for the revision were insufficient to show that compliance in accordance with Massachusetts Regulation 5.1.1 would be impractical.

31558 **APTIC NO. 53320**

Fri, Robert W.

ENVIRONMENTAL PROTECTION AGENCY. AIR QUALITY IMPLEMENTATION PLANS. PROPOSED RULEMAKING FOR CERTAIN STATES. *Federal Register, 38(135):18938-18975, July 16, 1973.*

Proposed rulemaking concerning the Environmental Protection Agency's air quality implementation plans is set forth for the state of Alaska, Arizona, California, Illinois, Utah, and Washington. Proposed regulations that can be implemented to attain the carbon monoxide standards in the Northern Alaska Intrastate Region have become necessary due to Alaska's failure to hold public hearings for the consideration of alternative transportation and land use control strategies and to submit a plan in compliance with EPA requirements. Studies by the Agency indicate that a reduction on the order of 54% would be necessary in projected 1975 emissions of CO in Arizona in order to attain the national primary ambient air quality standards. A significant reduction of reactive hydrocarbons in California will have to occur if the ambient air quality standards for photochemical oxidants are to be attained. The Illinois proposed plan relates primarily to reductions in CO concentrations in the Chicago Central Business District. A 37% reduction in 1971 CO emissions can be achieved by 1975 through the impact of the Federal Motor Vehicle Control Program. Utah's failure to submit an acceptable control plan for CO in the Wasatch Front Region has necessitated emission control plans designed to reduce the expected 1975 CO emissions in the central business districts of the three principal cities in the region by approximately 50%. The Washington transportation control plan for CO and photochemical oxidants in the Puget Sound Intrastate Region and for CO in the Washington portion of the Eastern Washington Northern Idaho Interstate Region was approved with certain exceptions.

31559 **APTIC NO. 53322**

Fri, Robert W.

LOUISIANA PLAN. *Federal Register, 38(134):18652, July 13, 1973.*

The Environmental Protection Agency Administrator approved, with specified exceptions, Louisiana plans for implementation of the national ambient air quality standards. That portion of the plan not approved applied to the review of new sources and modifications; the plan did not contain legally enforceable procedures to prevent construction or modification of a source which would interfere with attainment or maintenance of the national standards as required by 40 CFR 51.18. Federal regulations were proposed on June 14, 1972 and promulgated on October 28, 1972; Louisiana held a public hearing and adopted a regulation to meet the requirements on April 17, 1973. The approval has been granted, effective July 13, 1973; and the agency finds that good cause exists for not publishing the actions as a notice of proposed rulemaking.

31560 **APTIC NO. 53323**

Fri, Robert W.

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. LOW EMISSION VEHICLES. *Federal Register, 38(134):18686, July 13, 1973.*

A proposal is set forth to revise the Clean Air Act definition of a low emission vehicle, in terms of attainment of standards significantly below statutory 1975 and 1976 Federal emission standards. The proposed regulations would also set emission standards which must be met by heavy duty vehicles in order to qualify as low emission vehicles. Revision would also concern the details of low emission vehicle determination in order to make sure that procedures parallel more closely the process of certification testing of vehicles under Section 206 of the Act. A publication of the notice of intent will discuss procedures and invite comments as to their applicability if significant portions of the established test procedures are considered irrelevant or impractical for the testing of the vehicle.

31561 **APTIC NO. 53334**

Fri, Robert W.

MASSACHUSETTS AND RHODE ISLAND. *Federal Register, 38(135):18878- 18880, July 16, 1973.*

The United States Court of Appeals for the First Circuit on April 11, 1973 decided the cases of Natural Resources Defense Council, Inc., et al., versus the Environmental Protection Agency, Case Nos. 72-1219 and 72-1224 and challenged the EPA Administrator's approval of certain portions of the Massachusetts and Rhode Island implementation plans under section 110 of the Clean Air Act. The Court first found that the Rhode Island plan did not expressly provide for revision after public hearings on the occasions and under the circumstances described in section 110(a) (2) (H). The Court also found that both Massachusetts and Rhode Island had variance statutes which allowed the State air pollution agencies to grant variances even after the mandatory dates for attainment of the national ambient air quality standards in section 110. It was also held that provisions relating to reporting of emission data and the public availability of such data in the Massachusetts plan should have been disapproved on the basis of being discretionary. The Court order also required the Administrator to promulgate regulations to replace the disapproved sections of the two State plans. Regulations are set forth for both states regarding revision requirements.

31562 **APTIC NO. 52708**

Fujii, Masami

DISCUSSION OF VARIOUS PROBLEMS ON AIR POLLUTION CONTROL. *(Taiki osen taisaku jo no shoshu no mondaiten). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 2(1):8-13, Jan. 1973.*

Trends in air quality, air pollution monitoring, and air pollution control in Japan were examined. Sulfur oxides concentration peaked in 1967 at an annual mean value of 0.040 ppm and has been slowly decreasing since then. The decrease is attributed to the increased use of flue gas desulfurization techniques and higher stacks. By 1975, the SOx concentrations should meet the emission standards. The nitrogen oxide emission standards are still to be determined, but the proposed daily mean value is 0.02-0.025 ppm. Monitoring results indicate that NOx emissions are still the most difficult air pollution problem. Carbon monoxide emissions increased until 1970 and have been decreasing gradually since that time. A major CO problem still exists at heavy traffic intersections. Automatic monitoring systems for particulates are well established throughout the country, with new methods being constantly tested. Environmental monitoring is slowly emerging as a new branch of science.

31563 **APTIC NO. 52839**

Hanmer, Rebecca W.

ENVIRONMENTAL PROTECTION AGENCY. ENVIRONMENTAL IMPACT STATEMENTS. AVAILABILITY OF EPA COMMENTS. *Federal Register, 38(147):20497-20498, Aug. 1, 1973.*

Appendixes relating to Environmental Protection Agency comments on environmental impact statements are summarized. The draft impact statements reviewed between June 16 and June 30, 1973 are listed. The definitions are given of the classifications of the EPA comments on the draft impact statements. The final environmental impact statements commennted upon during the review period are listed. Proposed Federal agency regulations, proposed legislation, and other proposed actions reviewed and commented upon are discussed.

31564 **APTIC NO. 53491**

Hemeon, Wesley C. L.

A CRITICAL REVIEW OF REGULATIONS FOR THE CONTROL OF PARTICULATE EMISSIONS. *J. Air Pollution Control Assoc., 23(5):376-387, May 1973. 25 refs.*

Regulations for the control of particulate emissions are critically reviewed. The design of present emission standards began with the Los Angeles rules of 1949 based on a survey of industries in the region and on engineering consideration of what was feasible for those industries to comply with, in terms of commercially available gas cleaning equipment. The Clean Air Act of 1967 was based on another California Act which required the development of an ambient air quality standard and the measurement of existing concentrations of pollutants. This system was unworkable because it required states to develop emission regulations either by measurement of air quality or by data on existing emissions or both. The 1970 Amendments to the Clean Air Act require states to establish and operate appropriate devices, methods, systems and procedures necessary to monitor, compile, and analyze data on ambient quality. The number of samples and sampling stations are among the provisions not specified. There is no evidence that health is impaired by air pollutants, yet the 1970 Amendments provide that primary ambient air quality standards are those requisite to protect the public health, secondary standards are to protect the public against sensory air pollution offenses. The methods advocated by the Environmental Protection Agency for measurement of particulate matter in ambient air are an integral part of air pollution regulations. The EPA does not recognize the sampling techniques of the American Society of Testing Materials and the American Society of Mechanical Engineers although their techniques produce the same results as the modified EPA train that the EPA specifies be used.

31565 **APTIC NO. 53148**

Hoover, L. J., J. E. Norco, and R. L. Reisenweber

ENVIRONMENTAL MANAGEMENT OF FEDERAL FACILITIES. *Argonne National Lab., Ill., Center for Environmental Studies, Subcontract EPA-IAG-0225, 160p., Jan. 1973. 11 refs. NTIS: ANL/ES-21*

The Federal government has provided impetus in formulating and implementing necessary national environmental policies. Commensurate with requiring active pursuit of environmental goals by states, communities, industry, and individuals, the Federal government must provide strong leadership in attaining environmental cleanup of its own facilities. The Federal agencies have generally established a commendable record in achieving this goal; however, changing legislation as well as new, diverse and more rigorous environmental standards mandate increased expenditures for environmental pollution control and utilization of the best available management techniques. An analysis of alternative approaches for fulfilling these needs is described. Alternative environmental management programs are presented, including identification of roles, environmental information systems, resource requirements, and a comparison of the alternatives. The alternatives place varying degrees of responsibility on the Environmental Protection Agency, state and local pollution control agencies, and the Federal facilities. (Author abstract modified)

31566 **APTIC NO. 52715**

Matsumoto, Seizo

THE PRESENT SITUATION AND THE FUTURE OF MEASURES AGAINST PHOTOCHEMICAL SMOG. *(Kokagaku sumoggu taisaku no genjo to sono kongo). Text in Japanese. PPM (Japan), 4(7):62-66, July 1973.*

The plans and programs of the Special Committee for Measures against Photochemical Smog in Japan are reviewed. The Committee consists of 14 officers from different related divisions of the Japanese ministries and government agencies concerned with air pollution. Their plans include surveys, research programs, control enforcement, air pollution forecasting systems, monitoring, and health measures.

31567 **APTIC NO. 52665**

Murata, Motohide

STATISTICAL EVALUATION OF AIR POLLUTION SUBSTANCES AND ITS APPLICATION. *(Taikiosenshitsu no tokeiteki hyokaho to sono oyo). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 1:26-30, March 1973. 24 refs.*

Various regulations are being issued in Yokkaichi to reduce sulfur dioxide emissions from a petroleum refinery. A statistical study was made to determine the reduction of SO2 due to various control methods.

31568 **APTIC NO. 52681**

Nakayama, Yoshihiro

PUBLIC EXPENDITURE FOR THE TREATMENT OF RESPIRATORY DISEASES DUE TO AIR POLLUTION.

(Taiki osen ni kakawaru kokyuki-shikkan no kohi futan ni tsuite). Text in Japanese. Chiryo (Therapy), 55(5):1181-1184, May 1973.

The Tokyo government helps support the cost of medical treatments for chronic bronchitis, bronchial asthma, asthmatic bronchitis, and pulmonary emphysema due to pollution. Patients must have lived in Tokyo for more than a year (4 months for children younger than 3 years) and must have not finished compulsory education in order to receive the treatments. An application for support must be accompanied by a medical examination consisting of an X-ray, lung function test, blood tests, and sputum sample. Other tests may be required. For children younger than 5 years, only an X-ray is required.

31569 **APTIC NO. 53099**

Rubin, David M., Thomas H. Harris, David W. Jones, Jr., David Peter Sachs, and Clarence A. Schoenfeld

ENVIRONMENTAL INFORMATION. *Ann. N. Y. Acad. Sci., vol. 216:171-177, May 1973. 26 refs.*

The public and press receive information concerning environmental deterioration essentially from three sources: the scientific and academic communities; government agencies; and private corporations. Since the work of the first is largely unintelligible to the public and not readily obtainable, the other two sources provide most of the information for the press and public. However, for reasons of national security, partisan politics, lobbyist intervention, or economic profit, government information is often withheld from the public. Private corporations also often withhold information because it involves trade secrets or other competitive information. Passage of the National Environmental Policy Act of 1969 has increased the flow of information from the government, and measures should be investigated to improve the flow from private corporations. Access to information is only half the problem in creating an environmentally aware public; the other half is in the performance of the mass media in communicating the information which is available to the public. The press should strive to create an awareness of environmental problems and then seek to develop an understanding of underlying principles, issues, and answers. On a national basis, the news media have achieved the first goal. However, internal and external pressures blunt their ability to provide an understanding of the specific problems and answers, especially on the local level. The possibility in the next 15 years of a nation wired by coaxial cable with a two-way capacity promises to improve the level of public knowledge concerning environmental problems.

31570 **APTIC NO. 52748**

Schmitz, Paul

LEGISLATION CONCERNING THE MAINTENANCE OF CLEAN AIR IN FRANCE. *(Gesetzgebung zur Luftreinhaltung in Frankreich). Text in German. TUE (Tech. Ueberwach.), 14(8):239-240, 1973.*

The nucleus of French legislation concerning measures against air pollution is the Law of August 2, 1961. The responsibility for executing the law rests with the Minister for the Protection of Nature and the Environment. The law is applicable to all possible sources of air pollution. Based on this law, a special regulation concerning the protection of Paris was issued on September [illegible] 1963. By this law the city of Paris is divided into two protection zones. The division of all industrial enterprises into three groups, namely into those which cannot be erected and operated in residential areas, those which can but must be equipped with emission-reducing devices, and those which are harmless and can coexist with residential areas, dates back to Napoleon I. Plants of the first two kinds now require a special license prior to erection. The law especially regulating firing systems dates back to 1948. A first regulation to this law issued in 1957 calls for repeated monitoring of boilers with capacity greater than 1500 kg/hr and water heaters with a capacity of more than 10 to the 6th power kcal/hr. Another 1957 regulation expands the 1948 law to include all domestic heaters. Several regulations stemming from 1963, 1964, 1969, and 1970 regulate the automobile emissions. The limit value for unburned hydrocarbons is 0.15% of the fuel consumption. For gasoline four-stroke engines installed in automobiles with a total weight of up to 3.5 tons, the limit value for carbon monoxide in the idle mode is 4.5% by volume.

31571 **APTIC NO. 52709**

Takano, Masayoshi

A SUMMARY OF ODOR CONTROL LEGISLATION AND ITS FUTURE PROBLEMS. *(Akushu boshiho no gaiyo to kongo no doko). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 2(1):51-55, Jan. 1973.*

Legislation concerned with odor control and standards is reviewed. The odor control law was effected at the 65th Japanese Diet session and was put into effect in May 1972. Ammonia, methyl mercaptan, hydrogen sulfide, methyl sulfide, and trimethyl amine were singled out as specific odorous pollutants. Odor control regions were specified, and enforcement procedures were set. Methods for the determination of odor controls, standards, permissible ranges of odorous emissions, measurement techniques, source inspection procedures, and other legal aspects are reviewed.

31572 **APTIC NO. 52997**

Tewksbury, I. G., M. W. Rockefeller, and T. Snedeker

AN ANALYSIS OF THE REGULATORY ASPECTS OF FUEL OIL SUPPLY. (FINAL REPORT). *Foster Associates, Inc., Washington, D. C., Office of Air and Water Programs, Contract 68-02-0640, Pub-APTD-1461, 117p., June 1973.*

NTIS: PB 22[illegible]04

A study was conducted to review the current regulatory picture affecting the supply and distribution of natural gas and low sulfur fuel oil, to analyze possible changes in this regulatory picture, and to appraise alternate regulatory strategies which could bring about increased supplies of these clean-burning fuels. The results of the study contained in two separate reports, one report for natural gas and the other for fuel oil, both of which are provided. Regulatory bodies affecting the supply of oil are discussed, including: state regulatory agencies, Federal regulatory independent agencies, and executive departments. A mandatory oil import program, regulatory means of increasing low sulfur fuel supply, and cost effectiveness and time requirements for alternative regulatory strategies to increase low sulfur fuel supplies are reviewed.

31573 **APTIC NO. 53278**

Tsunoda, Yoshihiro

PRESENT STATE OF ODOR PROBLEMS IN SAPPORO CITY, AND CONTROL MEASURES - RELOCATION CASES OF ANIMAL BONE/HIDE/FAT PROCESSING FACTORIES. *(Sapporo-shi ni okeru akushu mondai no genjo to taisaku - Kaseijo no iten no jirei -). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 3(11):42-51, May 1973. [illegible] refs.*

Complaints about odors in Sapporo city have increased over the years. Odor sources include livestock yards, animal bone/hide/fat processing plants, refuse disposal plants, sewage disposal plants, and human waste disposal plants. Two animal/bone/hide/fat processing plants have been relocated with assistance from the city. When the plants were relocated, they were also modernized to reduce odors. The city provided the plants with loans with low interest rates to facilitate the move. An independent party evaluated the new equipment and processes.

31574 **APTIC NO. 52672**

Yoshida, Katsumi

CAUSE AND EFFECT VIEWED FROM A MEDICAL STANDPOINT AND A LEGAL STANDPOINT. (Ekigakuteki ingakankei to hoteki ingakankei ni tsuite). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie. Prefect. Pub. Nuisance Center Annu. Rep.), no. 1:9-14, March 1973.

The Yokkaichi Branch of the Tsu District Court gave a legal decision on an environmental pollution case in July 1972 which related the cause of disease and the effect of pollution from a legal standpoint. The sulfur dioxide discharged from a giant petroleum refinery in Yokkaichi was determined to be the cause of respiratory diseases. The decision developed the idea of cause and effect and the idea of probability of cause.

1972

31575 **APTIC NO. 52526**

INDUSTRY SEEKS FLEXIBILITY IN LEAD RULES. *Oil Gas J., 70(16): 56-57, April 17, 1972.*

Modification of lead and phosphorus additives in motor gasoline is requested by the oil industry. The proposed maximum allowable trace levels of lead in unleaded gasoline of 0.05 g/gal would have potentially severe impact on the transportation and marketing segments of the oil industry. Auto makers request of 1-year delay in 1975 clean-air standards is discussed. The Lead Industries Association opposed removal of lead from gasoline on the basis that the Environmental Protection Agency has not demonstrated that the existing use of lead in gasoline poses a health hazard to the public as required by law. It also argued that no positive and benefical effects for the public resulting from the proposed limitations on lead additives had been established.

31576 **APTIC NO. 53117**

Oak Ridge National Laboratory, Tenn., Environmental Information Systems Office

AN INVENTORY OF ENERGY RESEARCH. A REPORT PREPARED FOR THE NATIONAL SCIENCE FOUNDATION RESEARCH APPLIED TO NATIONAL NEEDS (RANN). VOLUME I. *Agreement AAA-R-4-79, 640p., Jan. 1972.*

NTIS: ORNL-EIS-72-18V-1

A survey of current research on energy problems, and the aspects of energy production and use is presented. Over 4400 research projects relating to energy problems are listed and project descriptions are given in the following major categories: fossil fuels, general; coal, petroleum, natural gas, nuclear, general; nuclear fission; nuclear fusion and plasmas; hydraulic; solar; geothermal, wind; wood and other biological; chemical, and unspecified energy source. Summary tables are provided which enumerate the total research effort within each major category, the total number of projects reported, the number of projects for which the 1971 funding level was reported, and the total dollar amount reported for that year. The total number of projects conducted in each state is given. Simple indexes on research institutes, sponsors, principal investigators, and a permuted index on titles are presented.

31577 **APTIC NO. 53118**

Oak Ridge National Laboratory, Tenn., Environmental Information Systems Office

AN INVENTORY OF ENERGY RESEARCH. A REPORT PREPARED FOR THE NATIONAL SCIENCE FOUNDATION RESEARCH APPLIED TO NATIONAL NEEDS (RANN). VOLUME II. *Agreement AAA-R-4-79, 337p., Jan. 1972.*

NTIS: ORNL-EIS-72-18V-2

A survey of current research on energy problems, and the aspects of energy production and use are presented. Over 4400 research projects relating to energy problems were listed and project descriptions given in the following major categories: fossil fuels, general; coal; petroleum; natural gas; nuclear, general; nuclear fission; nuclear fusion and plasmas; hydraulic; solar; geothermal; wind; wood and other biological; chemical; and unspecified energy source. Volume two includes indexes on research institutes, sponsors, principal investigators, and a permuted index on titles of the inventoried projects which were presented in volume I.

31578 **APTIC NO. 53121**

World Bank Group

THE WORLD ENVIRONMENT AND THE WORLD BANK. *14p., June 1972.*

The role assumed by the World Bank Group in protecting the world environment is discussed. The World Bank Group prepares and finances projects for economic development in the developing countries of the world. The planning of these projects involves careful attention to possible consequences for the environment and to the health and well being of affected peoples. Every project that might possibly adversely affect the environment of a recipient country is reviewed for its ecological implications by the Bank s Environmental Advisor s Office. For this purpose, a checklist has been developed which is used in the evaluation of the environmental effects of almost all Bank projects. The checklist includes specific and more general considerations regarding the following types of development projects: irrigation systems, sewage projects, petrochemical industry, mining activities, ports and harbor development, power plants, pulp and paper industry, airports, smelting plants, fertilizer plants, dam construction, and road construction. To illustrate the environmental work of the Bank, three case studies are discussed. In one instance, a consultant was hired by the Bank to determine what the possible environmental and health effects of a prospective irrigation project in the Yagoua district of Cameroon might be. The Bank also financed a project exclusively for the abatement of water pollution in Sao Paulo s Tiete River. In another instance, the Bank and the Yugoslav marine biology station at Dubrovnik, Yugoslavia worked together to develop a plan to minimize adverse effects on the Adriatic Sea of a new tourist resort near Dubrovnik.

31579 **APTIC NO. 53125**

Office of Air Programs, Research Triangle Park, N. C.

AIR QUALITY DATA HANDLING SYSTEM USERS MANUAL. *Stationary Source Pollution Control Program Pub-APTD-1086, 70p., Nov. 1972. 4 refs.*

NTIS: PB 220985

The Air Quality Data Handling System (AQDHS) which was developed to aid air pollution ccontrol agencies in the handling of their air quality and meteorological data is intended to be used by state and local air pollution control agencies on their own computer system. The AQDHS Users Manual describes the computer system and its operation, manual data preparation specifications, file creation, storage, update programs, data analysis programs, data report programs, and the National Aerometric Data Bank Input programs. Two appendices are included one for data identification codes and the other for trace and exhibit features. (Author abstract modified)

31580 **APTIC NO. 53147**

Buchan, Glenn Carl

A CYBERNETIC APPROACH TO THERMAL POLLUTION DECISION-MAKING. *Texas Univ., Austin, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., Aug. 1972, 478p. 185 refs.*

The study involves an interdisciplinary analysis of thermal pollution from a societal decision-making point of view. An analytical ecosystem model is developed to predict the physical and biological alterations resulting from the discharge of waste heat. The study analyzes the societal decision-making processes such as economic, political, and legal involved in determining the acceptability of the new ecological state. Specific recommendations for improving the overall process are made. The physical portion of the ecosystem model examines aquatic, atmospheric, and combined methods of waste heat discharge, with emphasis on the feedback mechanisms between aquasystems and the atmosphere. One portion of the physical model involves the development of a three-dimensional thermal model for rivers with feedback to the atmosphere. Coupling processes between aquatic and atmospheric thermal discharges are examined. The output of the physical model is used as an input to the biological model which determines the change in the ecosystem stability caused by the introduction of the thermal disturbance. A combined political-legal approach to thermal pollution decision-making is proposed along with specific recommendations for its implementation. (Author abstract modified)

31581 **APTIC NO. 53111**

Cameron, A. V.

THE DEVELOPMENT OF AN EXPLICIT POLICY FOR THE DISTRIBUTION OF UTILITY IN A SOCIETY. *Preprint, Inst. for Management Sciences, Pleasantville, N. Y., 5p., 1972. 4 refs. (Presented at the Institute for Management Sciences, International Meeting, 19th, Houston, Tex., April 4-6, 1972.)*

When alternative distributions of utility are compared, not only must per capita utility be taken into account, but also the equality of the distribution between the members of the society must be considered. Similaly, for environmental problems, even though average pollution levels may be low, there is general concern for locations within the society that are very highly polluted. A recently developed technique which allows a decision maker or legislative body to explicity quantify preferences for the distribution of utility to members of a society or group is described. Preferences for total or per capita utility, quality of the distribution, and minimum utility levels can all be specified in terms of an equity function defined on the utilities of the distribution. Empirical methods for constructing the equity function are discussed. Practical application of the equity function technique parallels the use of risk analysis in capital investment decisions. (Author abstract modified)

31582 **APTIC NO. 52632**

Dreyhaupt, Franz Josef and Herbert Bresser

BUFFER ZONES AS AN INSTRUMENT OF TOWN- AND REGIONAL PLANNING FOR THE PURPOSE OF PROTECTION AGAINST AIR POLLUTION. *(Schutzabstaende als Instrument der Stadt- und Regionalplanung zur Beruecksichtigung des Faktors Luftreinhaltung). Text in German. Technischer Ueberwachungs-Verein Rheinland e. V. and Ministerium fuer Arbeit, Gesundheit und Soziales des Landes Nordrhein-Westfalen, 96p., 1972. 16 refs.*

Problems of the standardization of minimum safety distances between industrial and business premises and residential areas are discussed, and a calculation method for the determination of such buffer zones is proposed. A comparison of empirical standards adopted in the USSR, Poland, Israel, and that proposed by Reichow shows considerable divergences regarding the safety distances. A newly proposed calculation method is based on a dispersion model for continuous emissions and different wind speeds and wind directions. The atmospheric dispersion is calculated according to the Pasquill method. Buffer zone standards are set with respect to the frequency of ground level concentrations exceeding the established maximum allowable concentrations. The ground level concentrations are calculated with respect to unit emission inventories according to the Gauss-Krueger coordinate system, as well as to the most unfavorable combinations of dispersion and meteorological conditions. Whereas classes of minimum buffer zones can thus be standardized, specific investigations in specific cases may be necessary for the determination of economically and environmentally acceptable buffer zones.

31583 **APTIC NO. 53384**

Kreis, R. Douglas and Lynn R. Shuyler

BEEF CATTLE FEEDLOTS SITE SELECTION FOR ENVIRONMENTAL PROTECTION. *National Animal Feedlot Wastes Research Program, Ada, Okla., Robert S. Kerr Environmental Research Lab. National Environmental Research Center Proj. 13040 WRW, Program Element B12039 EPA-R2-72-129, 44p., Nov. 1972. 55 refs.*

GPO

Considerations influencing the selection of a beef cattle feedlot sites which will be suitable for adequate pollution control and protection of the surrounding environment may be grouped into the following six categories: regulations, spatial requirements, topographic features, microclimates, soils and geologic structures, and social considerations. Several states have placed restrictions on the minimum distance that a feedlot can be located from surface water, residential dwellings, municipalities, recreation areas, and arterial highways. Spatial needs of various livestock feeding units will vary with the facility type and climate in which it is located. The total area required for an integrated system may be determined as the sum of the areas required for each of the following components: production area, extraneous storm water runoff diversion ditches, storm water runoff collection and retention structures, wastes storage and disposal sites, and a buffer zone around the feeding facility. Topography plays an important role for selection of feeding site since the slope and natural drainage to surface waters of a given parcel of land governs its value as a feeding site. Also, feeding facilities may be readily adaptable to sites which for topographical reasons are marginal for intensive farming. The microclimate of a prospective site may also have some bearing on its acceptability. Three aspects of the microclimate of a locale worthy of consideration are: extremes in wind conditions, solar radiation, and precipitation. Social considerations may be met by effective zoning to provent the encroachment of residential, shopping, and recretional areas. Soil types and the underlying geologic structure of each potential feeding site should be examined to insure maximum protection from groundwater pollution. Present trends in some states are directed toward regulating the amount of infiltration or percolation from pen surfaces and liquid wastes impounding structures.

31584 **APTIC NO. 53002**

Rossin, A. D.

EPISODE CONTROL STRATEGY FOR MOTOR VEHICLES. *Argonne National Lab., Ill., Center for Environmental Studies, Environmental Protection Agency, Interagency Agreement No. EPA-IAG-0025(R), 81p., Oct. 1972. 16 refs.*

NTIS: ANL/ES-19

An approach is developed for dealing with pollutants from motor vehicles during air pollution episodes. The ALERT strategies depends on cooperation of all people in the affected region to avoid nonessential use of automobiles when called upon to do so. If the episode becomes lengthy and severe, an emergency is declared, at which point businesses, industries, and schools are closed, in effect shutting down the activity of the entire community. This eliminates the need for most persons to use autos or trucks. The health effects related to carbon dioxide, photochemical oxidants, and oxides of nitrogen are summarized briefly, and the bases for designing strategies and setting alert criteria are presented. (Author abstract)

31585 **APTIC NO. 53001**

Wyllie, M. R. J.

PROFESSIONAL ETHICS AND ENVIRONMENTAL TECHNOLOGY. *Preprint, Automotive Engineers, Inc., New York, 6p., 1972. 1 ref. (Presented at the Society of Automotive Engineers, National Automobile Engineering Meeting, Detroit, Mich., May 22-26, 1972, Paper 720462.)*

The importance of solving technological environmental problems by the application of better technology is discussed. For example, to handle the population explosion, the population must be rationally dispersed and the world must grow a great deal more food; the use of chemicals in accomplishing the latter should be intelligently considered. Similarly, while the eutrophication of lakes is a problem, the removal of phosphates from detergents will not solve it. What must be done is to build the necessary sewage disposal plants and find a safe and effective phosphate substitute. Both this problem and the problem of automotive emissions represent areas in which technologists have failed to provide the public with adequate information as it relates to alternative courses of action. With regard to the emission problem, two parts of it have not been sufficiently explained to the taxpayer: the fact that automotive emissions can cause serious local problems; and the overriding importance of the buffering of the fly-wheel effect of cars, particularly older models, on the road. With regard to the former, the dispersed action which current federal policy represents is not an optimum one. With regard to the latter, the proposed emission standards set by the Federal government for 1975 and 1976 will not appreciably lower total automotive emissions for several years because of the presence of older cars on the road. The best method for dealing with the emission problem involves the use of lead tolerant catalysts in the exhaust system and seeing that old cars are properly tuned. It is the duty of technological societies to offer and publicize impartial, balanced advice to the public and politicians as to the best courses of action to pursue with regard to the types of technological problems discussed herein.

1971

31586 **APTIC NO. 52998**

Esso Research and Engineering Co., Linden, N. J., Government Research Lab.

A WORKING DOCUMENT FOR AIR POLLUTION MEASUREMENT TECHNIQUE DEVELOPMENT FISCAL YEARS 1972-1977. *Office of Air Programs Contract CPA-22-69-154, Pub-APTD-1451, 208p., Dec. 1971.*

NTIS: PB 221011

A working document for air pollution measurement technique development for the fiscal years 1972 through 1977 is presented. A summary of the measurement capabilities required and the legal justification for them is presented. Measurement techniques to support research and investigations, to identify and quantitate air pollutants, and to maintain adequate measurement capabilities are reviewed. Required resources for funding are also discussed. Techniques mentioned include, remote sensing, meteorological measurements, source testing, ambient air monitoring, and analytical methods.

31587 **APTIC NO. 53018**

Arthur D. Little, Inc., Washington, D. C.

TRANSPORTATION AND ENVIRONMENT: SYNTHESIS FOR ACTION. IMPACT OF NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 ON THE DEPARTMENT OF TRANSPORTATION. VOLUME I: SUMMARY. *Contract DOT-OS-00057, 79p., April 1971.*

NTIS: PB 201832

The impact of the National Environmental Policy Act of 1969 on the Department of Transportation was analyzed, and a set of alternative actions which the Department can utilize in complying with the Act was produced. An analysis was conducted of the Act and other current Department of Transportation legislation. Policies and procedures and identifying basic inconsistencies and opportunities for compliance with the purposes of the Act were developed. Policy alternatives available for consideration of environmental factors and documentation of how to measure and evaluate environmental impacts are discussed. (Author abstract modified)

31588 **APTIC NO. 53131**

OECD AND THE ENVIRONMENT: ROLE AND METHODS. *OECD Observer, no. 53:19-26, Aug. 1971.*

The Environment Committee of the Organization for Economic Cooperation and Development (OECD) was set up in 1970 to take over the work of the Committee for Research Cooperation. Natural resources and pollution control issues are being studied by ad hoc groups on air pollution from fuel combustion by stationary sources, in cooperation with the OECD energy and Oil Committees; and on pollution from the pulp and paper industry, with an industry committee. Other activities in this field will be carried out by sector groups on air pollution, water management, and chemicals in the environment. The tasks of the air management sector group are to investigate and define the problems of air pollution control; to review policies and programs for air pollution control and maintenance of air quality; to develop approaches to air quality protection, particularly for those problems with international implications; to develop an adequate basis of information for administrative action; and to assess the costs and benefits of alternative proposals. Another ad hoc will survey the impact of the motor vehicle on the environment and identify and evaluate alternative approaches to reducing automotive air pollution and noise. The work of the sector and ad hoc groups will be integrated by the Central Analysis and Evaluation Unit of OECD s Environment Directorate. This Unit is also concerned with assessing the economic effects of different methods of costing or paying for pollution control.

31589 **APTIC NO. 52615**

Carlin, Alan P. and George E. Kocher

ENVIRONMENTAL PROBLEMS: THEIR CAUSES, CURES, AND EVOLUTION USING SOUTHERN CALIFORNIA SMOG AS AN EXAMPLE. *Rand Corp., Santa Monica, Calif., R-640-CC/RC, 117p., May 1971. 61 refs.*

NTIS: N72 20549

Factors impeding the solution of environmental problems in general and photochemical air pollution in Southern California in particular are analyzed. Four primary underlying causes of pollution are identified; of these three are demand-increasing causes: population growth, growth in per capita income, and use of new technology incompatible with ecological purposes. The fourth cause, imperfections in the economic system, is a management-inhibiting cause. The five secondary causes of pollution are public sector underpricing chiefly with regard to overuse of government-owned land outside of urban areas; prodevelopment bias of government construction agencies, political disadvantage of those favoring environmental enhancement in comparison with those opposing it; lack of public interest; and jurisdictional problems. Most environmental problems go through similar chronological stages before final resolution. Nine stages are proposed: problem begins, first adverse public comment, official recognition of threat, technical underwriting of problem, public support for an effective governmental solution, effective solution approved by government, solution accepted by those most affected, implementation complete, and problem resolved. Photochemical air pollution in Southern California is traceable to all four primary causes and to the last three of the five secondary causes of environmental problems. After a 17 year delay, California reached the sixth stage in 1968 when the state adopted an effective approach for controlling motor vehicle emissions. Stage seven may have been reached in the case of automobile manufacturers in late 1969. Stage eight will probably not be complete before 1975 in Southern California, while final resolution of the photochemical air pollution problem is unlikely before the mid-1980s.

31590 **APTIC NO. 52983**

Donovan, Peter A.

THE FEDERAL GOVERNMENT AND ENVIRONMENTAL CONTROL: ADMINISTRATIVE REFORM ON THE EXECUTIVE LEVEL. *Boston Coll. Ind. Commer. Law Rev., 12(4):541-570, March 1971. 73 refs.*

While all levels of government are responsible for achieving and maintaining environmental quality, the Federal government must provide the incentive for any meaningful national achievement. The National Environmental Policy Act of 1969 declared the dual Federal objective of restoring and maintaining environmental quality, established the Council on Environmental Quality, and is intended to require Federal agencies and officials to follow its policies, goals, and procedures unless their existing statutory authorizations are in contradiction with them. The Environmental Quality Improvement Act of 1970 established the Office of Environmental Quality and states that the primary responsibility for implementing the national environmental policy rests with state and local governments. In an executive reorganization, the Environmental Protection Agency was created and was given authority over most Federal environmental protection programs. The National Oceanographic and Atmospheric Administration, responsible for long-range plans in the preservation of the ocean and the atmosphere, was also established, and a Pollution Control Section of the Department of Justice was created to strengthen enforcement of anti-pollution programs. There is some question whether administrative changes alone can be effective in improving environmental quality, and increased citizen participation in governmental decisions may also be supported by the National Environmental Policy Act.

31591 **APTIC NO. 53524**

Meyers, Charles R., Jr.

NEW TOOLS FOR REGIONAL PLANNING. *AIA (Amer. Inst. Arch.) J., 1971:37-40, Oct. 1971.*

Significant achievements have been made in the development and application of modeling techniques for urban transportation planning and a number of research efforts have been directed toward the development of economic and land use models. Presently, a research effort to develop a modeling methodology and to build and test a comprehensive regional model is underway at the Oak Ridge National Laboratory where research in the International Biological Program revealed the need to direct attention toward solving environmental problems. The initial phase of an ORNL-NSF regional modeling effort has produced a holistic regional model in which the human ecosystem is separated into four general categories, one of which accounts for changes in the physical environment on the biological system such as the effects of pollutants on plants and animals. Another regional model described incorporates an air diffusion submodel which distributes the pollution from a combination of sources, such as space heating or new locations of industry, etc., that are simulated in a land use model.

31592 **APTIC NO. 52542**

Wurster, Charles F.

DDT GOES TO TRIAL IN MADISON. *In: Pollution. Foundations for Today, Robert S. Leisner, and Edward J. Kormondy (eds.) Vol. 2, Dubuque, Iowa, Wm. C. Brown, Co., 1971, p. 22-27. 28 refs.*

The hearings, held in Madison, Wisconsin, on the question of the persisting residues of DDT from the use of pesticides are reported. The hearings involved 27 days of testimony from 32 witnesses, filled nearly 3000 pages of transcript and included 208 exhibits. The hearings are described, including the judicial process itself, and the testimony is reviewed. The environmental problems, especially the effect of DDT on reproduction and on human health was considered.

1970

31593 **APTIC NO. 52595**

Comella, Joseph R.

AIR POLLUTION CONTROL IN CHICAGO. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 28-30. (Nov. 18-19.)*

Air pollution control in Chicago is discussed. Enforcement of regulations is reviewed and the problems encountered by the printing industry in developing good smoke and odor control devices described. Compliance with the regulations and citizens complaints about odors were also discussed.

31594 **APTIC NO. 52597**

Gadomski, Raymond R.

GATF PROGRAM ACTIVITIES. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 33-35. (Nov. 18-19.)*

The environmental control program activities of the Graphic Arts Technical Foundation are briefly summarized. Program activities include: an information and referral service for members on pollution laws and governmental procedures and practices, technical assistance in the form of individual consultation, and research to define problems and to develop instrumentation and procedures for obtaining and analyzing emission samples. Results of a study of printing processes are also reviewed.

31595 **APTIC NO. 52607**

Geis, A. John

CONFRONTATION - PRINTING MANAGEMENT AND AIR POLLUTION CONTROL AUTHORITY. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 105-110. (Nov. 18-19.)*

The relationship of the printing industry with air pollution control agencies is discussed. Various problems connected with compliance to regulations are reviewed. The control of smoke, odors and hydrocarbon emissions by incineration, process modifications, and the use of inks with odorless solvents is discussed also.

31596 **APTIC NO. 52593**

Hanson, Vernon R.

IMPLEMENTATION. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 17-21. (Nov. 18-19.)*

Implementation of Federal legislation on air quality in Illinois is described. Three control agencies were formed by the state -- a policy making group responsible for the adoption of rules and regulations, the conduct of public hearings in enforcement and rule making activities, and responsible for most matters relating to Air Quality Control Regions; an investigative arm for obtaining facts presented to the above board; and an institute consisting of physical facilities and a technical staff for conducting abstract scientific research. The effect of the Clean Air Act on control programs is reviewed, and the planning of the implementation program and the problems involved are reviewed.

31597 **APTIC NO. 52594**

Lunche, Robert G.

THE LOS ANGELES AIR POLLUTION CONTROL PROGRAM AND THE PRINTING INDUSTRY. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 22-27. (Nov. 18-19.)*

Air pollution in the Los Angeles area is described and the County control program is discussed. The rules applicable to the printing industry are reviewed and explained. Enforcement procedures and court and hearing board actions are also reviewed.

31598 **APTIC NO. 52592**

Morgan, George B.

NEW LEGISLATION FOR CONTROLLING AIR POLLUTION. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 10-16. (Nov. 18-19.)*

New legislation for controlling air pollution is reviewed. A summary of the major provisions of the Clean Air Act is presented including provisions for research, grants for air pollution control programs, air quality control regions, national air quality standards, state implementation plans, new source performance standards, hazardous emission standards, enforcement procedures, inspections and monitoring, abatement conferences, Federal facilities, emergency powers, citizen suits, Federal procurement, administrative proceedings and judicial review, mandatory licensing, and environmental impact review.

SOCIAL ASPECTS

1972

31599 **APTIC NO. 53368**

McKechnie, George Ellis

A STUDY OF ENVIRONMENTAL LIFE STYLES. *California Univ., Berkeley, Dept. of General Psychology, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., Aug. 6, 1972, 159p. 82 refs.*

The environmental life styles of a stratified random sample of Marin County, California residents were investigated through the administration of three research instruments. A total of 433 subjects were administered the Environmental Attitudes Survey (EAS) which measures attitudes toward significant Marin County environmental issues, as well as environment related demographic variables. Of these, 255 also completed the Environmental Response Inventory (ERI) and the Leisure Activities Blank (LAB). Seven dimensions emerged from a factor analysis of 150 ERI items: urbanism, environmental adaptation, stimulus seeking, environmental trust, need privacy, mechanical orientation, and environmental nostalgia. The LAB assessed past leisure and recreational behavior and future recreational desires. Four male and five female recreation types emerged. The preservation of open space was the primary concern of the subjects bases on the EAS. Seven environmental attitudes were prevalent: Traditional freeway and housing development, willingness to pay additional taxes to solve environmental problems, antirapid transit, concern about population, antirecreational development, housing issues, and general dissatisfaction. There are six key factors in environmental life styles: adventure, elite conservation, homemaking, pastorale, retiring and commute which yielded 11 environmental life style types. The most useful predictors were the demographic variables, especially education level and commuter status. The ERI variables were also active, but the LAB scales were generally poor predictors of the environmental attitude criteria. (Author abstract modified)

GENERAL

1973

31600 **APTIC NO. 53056**

Fokina, V. D.

CLEAN AIR MAINTENANCE IN GREAT BRITAIN. *(Okhrana chistoty atmosfernogo vozdukha v Velikobritanii). Text in Russian. Gigiena i Sanit., no. 6:88-90, 1973. 2 refs.*

Problems of and measures taken in clean air maintenance in Great Britain are surveyed. Gasoline and diesel engine emissions, as well as emissions from combustion equipment constitute the major source of air pollution in Great Britain. Emissions generated by combustion processes, when combined with fog under temperature inversion conditions, may frequently result in smog, such as that which occurred in London in 1952. Automatic recording analyzers for wind, sulfur dioxide, carbon monoxide, and hydrochloric acid are used for air pollution monitoring. Warning is triggered by SO2 concentrations above a given threshold value by the London monitoring system via telephone lines. Increase of the traffic speed, traffic ban in certain streets and entire areas, increased use of diesel engine vehicles instead of gasoline engine-powered ones, and use of electric vehicles are among the principal measures being taken in the traffic-generated pollution abatement area. The 1956 Clean Air Act imposed ban on the use of certain types of fuels in specific areas.

31601 **APTIC NO. 53574**

Moriguchi, Minoru

THE AIR ENVIRONMENT VOLUME. *(Taiki kankyo yoryo ni tsuite). Text in Japanese. 8p., May 1973.*

Nature keeps the qualitative level of the environment constant by recycling wastes and natural resources. This capacity is called the environmental volume. When the pollutant load exceeds the natural cleaning power, the environment becomes polluted. Therefore, the amount of pollutants must be reduced. The natural elimination of pollution is discussed including nature s cleaning power, retention times for pollutants, and a mathematical estimate of cleaning power.

31602 **APTIC NO. 53299**

Neikes, Joerg

CITY IMAGE (V): DUISBURG. FIFTY DAYS OF SMOG HAZARD. *(Stadteportrat (V): Duisburg. An 50 Tagen Smoggefahr). Text in German. Umwelt. (Duesseldorf), no. 3:28-31, June 1973.*

The decline of Duisburg as a residential city because of air pollution is described. Duisburg is an industrial center for the iron and steel industries; these industries are the direct cause of the harmful pollutants in the city air. In some sections of the city, sulfur dioxide concentration in the air is as high as 0.6 mg/cu m, a concentration considered a health hazard. Although the industry has succeeded in the removal of perceptible air pollutants by means of filters, the affinity of gases and vapors for fine dust particles is about 90% and these particles are the basis of the smog; they are loaded with SO2 and other poisonous gases and are easily inhaled. The life expectancy of the residents of Duisburg has been shortened by about 10 years; the lack of oxygen has deleterious effects on schoolchildren; the poor cerebral circulation resulting from such atmosphere is responsible for more aggressive behavior and crime. To counteract the lack of oxygen, the planting of trees is greatly encouraged, in the hope that these will form a natural air filter. There is also a tendency to create a buffer zone between the factories and residential areas.

1972

31603 **APTIC NO. 53134**

SMOG IS POISONING THE CITIES. *(Lo smog avvelena le citta). Text in Italian. Lo Smog (Italy), 1972:35-38, 1972.*

Automotive exhaust gases in the center of the Quirinale tunnel in Rome would kill anybody who would remain in the tunnel more than 2 hours. Exhaust gases contain from 3 to 10% carbon monoxide and oxides of sulfur, oxides of nitrogen, aldehydes, acrolein, lead compounds, and other pollutants. Lead compounds fall to the ground, are mixed with dust, are whirled up by traffic, and are inhaled by pedestrians with toxic effects. Much documentation has been gathered on air pollution in Italian cities but little has been done about it. The only two concrete steps were the transfer of the Volpato refinery from Milan to Talamone and the transfer of the Purfina refinery from Rome to the 32nd km on the via Aurelia. In Milan alone about a million tons of fuel are consumed annually; the resulting sulfur dioxide is oxidized by the action of sunlight to sulfur trioxide which with water vapor forms a sulfuric acid fog. Milanese citizens thus are recipients of 60,000 tons SO_2 and of 100,000 tons H_2SO_4 a year. Sixty percent of all deterioration of metals is due to the corroding effect of SO_2; in these respects Milan is the London of Italy. Dust fall is from 4.5 to 15 tons per sq km/mo (1953). In recent years dust fall has diminished due to partial replacement of oil for coal as fuel.

1971

31604 **APTIC NO. 52640**

Advisory Committee on Environmental Science and Technology, Oreg.

ENVIRONMENTAL QUALITY IN OREGON 1971 -- A SUMMARY OF CURRENT AND FUTURE PROBLEMS. *National Science Foundation Grant GT-14, 70p., 1971. 75 refs.*

NTIS: PB 201488

The state of environmental quality in Oregon was investigated with respect to air and water quality, solid wastes management, chemical wastes, environmental radiation, and land management. The major air pollution problem in Oregon is the emission of particulates, primarily from smoke, and the increase of sources associated with urbanization and industrialization. The major pollutant sources are lumber and wood production, pulp mills, field burning, metal processing, and motor vehicle emissions. Western Oregon has the highest potential, on a meteorological basis, for an air pollution problem of any area in the continental United States, since it has a very limited capacity to disperse air pollutants, with low wind movement, frequent inversions, and severe stagnation conditions. The incidence of persistent haze and visibility loss is increasing.

31605 **APTIC NO. 52545**

Schaefer, Vincent J.

SOME EFFECTS OF AIR POLLUTION ON OUR ENVIRONMENT. *In: Pollution. Foundations for Today. Robert S. Leisner and Edward J. Kormondy (eds.), Vol. 2, Dubuque, Iowa, Wm. C. Brown. Co., 1971, p. 42-44. 6 refs.*

Some effects of air pollution on the environment are discussed. The major souces of particulates are mentioned, especially industrial and mobile sources, and particulate concentration measurements throughout the country are reviewed. The effect of air pollutants on the weather system is considered, including the effects on cloud formation and precipitation.

31606 **APTIC NO. 52543**

Woodwell, George M.

RADIOACTIVITY AND FALLOUT: THE MODEL POLLUTION. *In: Pollution. Foundations for Today. Robert S. Leisner and Edward J. Kormondy (eds.), Vol. 2, Dubuque, Iowa, Wm. C. Brown Co., 1971, p. 28-31. 11 refs.*

The broader scientific aspects of the problems associated with the release of certain types of toxic wastes into the environment are summarized. The radiation-pollution problem is examined, and various solutions are considered for other analogous pollution problems, especially those of pesticides. Half-lives of radiation and pesticides and dilution of pollution are mentioned.

1970

31607 **APTIC NO. 52591**

Ling, Joseph T.

THE CHALLENGE OF POLLUTION CONTROL. *Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 2-9. (Nov. 18-19.)*

Pollution control in the printing industry is reviewed. The role of the public, governments, and industry in controlling pollution is discussed. Efforts made by one company to control industrial waste are described. Pollution control costs are mentioned.

31608 **APTIC NO. 52934**

Mayaudon, Enrique Marquez

THE CONTAMINATION OF THE AIR. *(La contaminacion del aire). Text in Spanish. Salud Publica Mexico, 11(1):45-50, Jan.-Feb. 1970.*

Causes and effects of air pollution, and the pressing need for technical quantification of pollutants are discussed. Industries and transportation represent the principal causes of air pollution due to their heavy emissions of toxic gases. Harmful results of contaminates on the human respiratory system are generally known as nonspecific, acute, high respiratory illness. The chronic effects can refer to various pulmonary ailments, lung cancer, and bronchial asthma. Although photochemical smog still has not been shown as a principal factor in chronic bronchitis and available evidence linking lung cancer to air pollution is insufficient, asthma can be associated with high pollution levels. Pollution can aggravate pre-existing ailments, bronchitis can be complicated by pneumonia and emphysema by bronchiolitis. In addition, toxics in the air can reduce body resistance to infection. A difficulty exists in establishing and quantifying the relationship between pollution levels and the immediate consequences for public health. One instance of such a determination is the pollution emission tolerances set by American law on automobile fuel. Quantification of air pollution is a fundamental prerequisite for establishing a control program. This includes collection of pollution samples and the subsequent analyses. Concerning sample collection, a net of stations should be set up to gather air samples in connection with meteorological work into dispersion and dilution of contaminates. Methods of pollution analyses include gravimetric, volumetric, colorimetric, nefelometric, turbidimetric, and chromatographic, coupled with spectrometry of mass, emission, and absorption, diffraction, microscopy, refractometry, and polarography. Objectives of pollution quantification include determination of contamination on health, on plants and animals, evaluation of economic losses due to pollution, development of new methods and control equipment, and dissemination of information to the public.

31609 **APTIC NO. 52596**

Schaeffer, William D.

AIR QUALITY IN THE PRINTING INDUSTRY - A PERSPECTIVE. Graphic Arts Technical Foundation, Proc. Graphic Arts Tech. Foundation Conf. Air Qual. Contr. Print. Ind., Chicago, Ill., 1970, p. 31-32, 143-144. (Nov. 18-19.)

A general perspective of air quality control in the printing industry is given. The recognition of a technical problem, an evaluation study of emissions from the industry, and the creation of an advisory board were reviewed. Two major areas are underscored -- the work of regulatory agencies and the continued need for research in analytical chemistry to provide better solutions to the pollution problem.

1966

31610 **APTIC NO. 52962**

Ewald, William R., Jr. and Harland Bartholomew

PREFACE AND INTRODUCTION. *In: Environment for Man: The Next Fifty Years. W. R. Ewald, Jr. (ed.), Bloomington, Ind., Ind. Univ. Press, p. vii-ix, 3-10, 279-282, 1966.*

A methodological approach to the determination of the optimum human environment is discussed. The discussion came out of a 1966 conference in which the physiological, psychological, and sociological aspects of the creation of the optimum environment were considered. A comprehensive effort to understand human environment might begin with the identification of the functions of environment, its controllable variables, the relationship of the variables to one another, the relationship between functions and variables, and the trade-off between functions (priorities). The functions and variables of the environment can then be ordered using the matrix approach, which allows for computerization. Among the functions of the environment are home life, school, shopping, commuting, work, leisure and recreation, experiences of nature, and healing. Controllable variables are climate, air, water, solid wastes, noise, supplementary food intake (e.g., alcohol, drugs), safety, privacy, and (applicable to traffic, people, sound, housing, etc.) gross number, density, duration, and frequency. Within the matrix, the relationship of environmental variables to each other can be calculated in terms of correlation coefficients. The relation between the functions and variables of the environment is expressed by technological and production functions which summarize the current state of dynamic process. This step involves mathematical analysis as well as extensive controlled experimentation. The matrix approach can then be used to determine how much of one function or several functions, as modified or described by combinations of controllable variables, can be traded for another or others. Appended are a matrix of controllable variables, a technological functions matrix, and a trade-off matrix showing the relation of function to function.

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